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

15-AMRP-0074

JAN 30 2015

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 1607-D2:5, INLET PIPE TO REPLACEMENT SYSTEM TILE FIELD SUBSITE, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2014-103 and supporting, "Remaining Sites Verification Package for the 1607-D2:5, Inlet Pipe to Replacement System Tile Field Subsite," Rev. 0. If you have questions, please contact me or your staff may contact Tom Post, of my staff, at (509) 376-3232.

Sincerely,

Mark S. French

Mark S. French, Director
River Corridor Division

AMRP:TCP

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-DR-1 **Control No.:** 2014-103

Waste Site Code(s)/Subsite Code(s): 1607-D2:5

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 1607-D2:5, Inlet Pipe to Replacement System Tile Field subsite, part of the 100-DR-1 operable unit, was added to 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* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999), as a candidate site for confirmatory sampling via the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2009). The 1607-D2:5 subsite was subsequently recommended for remedial action.

Remedial action at the 1607-D2:5 subsite was performed on April 22, 2014. The depth of the excavation extended approximately 1.5 m (5 ft) below ground surface, resulting in approximately 340 bank cubic meters (445 bank cubic yards) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility (ERDF). The waste material was staged prior to loadout to ERDF; therefore, a waste staging pile area was created. There is no overburden soil stockpile associated with the 1607-D2:5 subsite. No stained soil or anomalous materials were encountered during the remediation.

Verification sampling started on June 26, 2014, within the excavation and on July 29, 2014 at the staging pile area. The sampling was performed to determine if the waste site met the remedial action objectives and remedial action goals established by the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-97-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009b), and the Remaining Sites 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 and modeling results for the 1607-D2:5 subsite demonstrate that the site meets the remedial action objectives and corresponding remedial action goals established in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999) to support a reclassification to Interim Closed Out. These sampling and modeling 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. 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 1607-D2:5, Inlet Pipe to Replacement System Tile Field Subsite* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-103

Waste Site Code(s)/Subsite Code(s): 1607-D2:5

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	J P Neath	1/9/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	1/13/15
Ecology Project Manager (printed)	Signature	Date
NA		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D2:5, INLET PIPE TO REPLACEMENT SYSTEM TILE FIELD SUBSITE

Attachment to Waste Site Reclassification Form 2014-103

January 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D2:5, INLET PIPE TO REPLACEMENT SYSTEM TILE FIELD SUBSITE

EXECUTIVE SUMMARY

The 1607-D2:5, Inlet Pipe to Replacement System Tile Field subsite, part of the 100-DR-1 operable unit, is related to the 1607-D2:2 Replacement Tile Field, the 1607-D2:3 Septic Pipelines, and the 1607-D2:4 Septic Tank subsites. The 1607-D2:5 subsite was added to 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) as a candidate site for confirmatory sampling via the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (100 Area ESD) (EPA 2009). Subsequently, the 1607-D2:5 subsite was recommended for remedial action.

Remedial action at the 1607-D2:5 subsite was performed on April 22, 2014. The depth of the excavation extended approximately 1.5 m (5 ft) below ground surface resulting in approximately 340 bank cubic meters (445 bank cubic yards) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility. The waste material was staged prior to loadout to the Environmental Restoration Disposal Facility; therefore, a waste staging pile area was created. There is no overburden soil stockpile associated with the 1607-D2:5 subsite. No stained soil or anomalous materials were encountered during the remediation.

Verification sampling started on June 26, 2014, within the excavation and on July 29, 2014, at the staging pile area. A summary of the cleanup evaluation for the soil sampling results against the applicable remedial action goals is presented in Table ES-1.

Table ES-1. Summary of Remedial Action Goals for the 1607-D2:5 Subsite. (2 Pages)

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 1607-D2:5 subsite.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC direct exposure RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes

Table ES-1. Summary of Remedial Action Goals for the 1607-D2:5 Subsite. (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.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for the 1607-D2:5 subsite (6.0×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for individual carcinogens is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk (2.3×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 1607-D2:5 subsite.	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 the total uranium drinking water standard of 30 µg/L (21.2 pCi/L) [c].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	All detected COPCs were below soil RAGs for groundwater and/or river protection. Therefore, it is predicted that the residual concentrations of the contaminants will not reach groundwater (and thus the Columbia River) within 1,000 years.	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

The results of the verification sampling were used to make reclassification decisions for the 1607-D2:5 subsite 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 and modeling support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009b) and the Remaining Sites 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 and modeling 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. 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 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 1607-D2:5 subsite contaminants of potential concern and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, selenium, and vanadium. The U.S. Environmental Protection Agency ecological soil-screening levels were exceeded for antimony, manganese, selenium, and vanadium. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of antimony, manganese, and vanadium are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 1607-D2:5, INLET PIPE TO REPLACEMENT SYSTEM TILE FIELD SUBSITE

STATEMENT OF PROTECTIVENESS

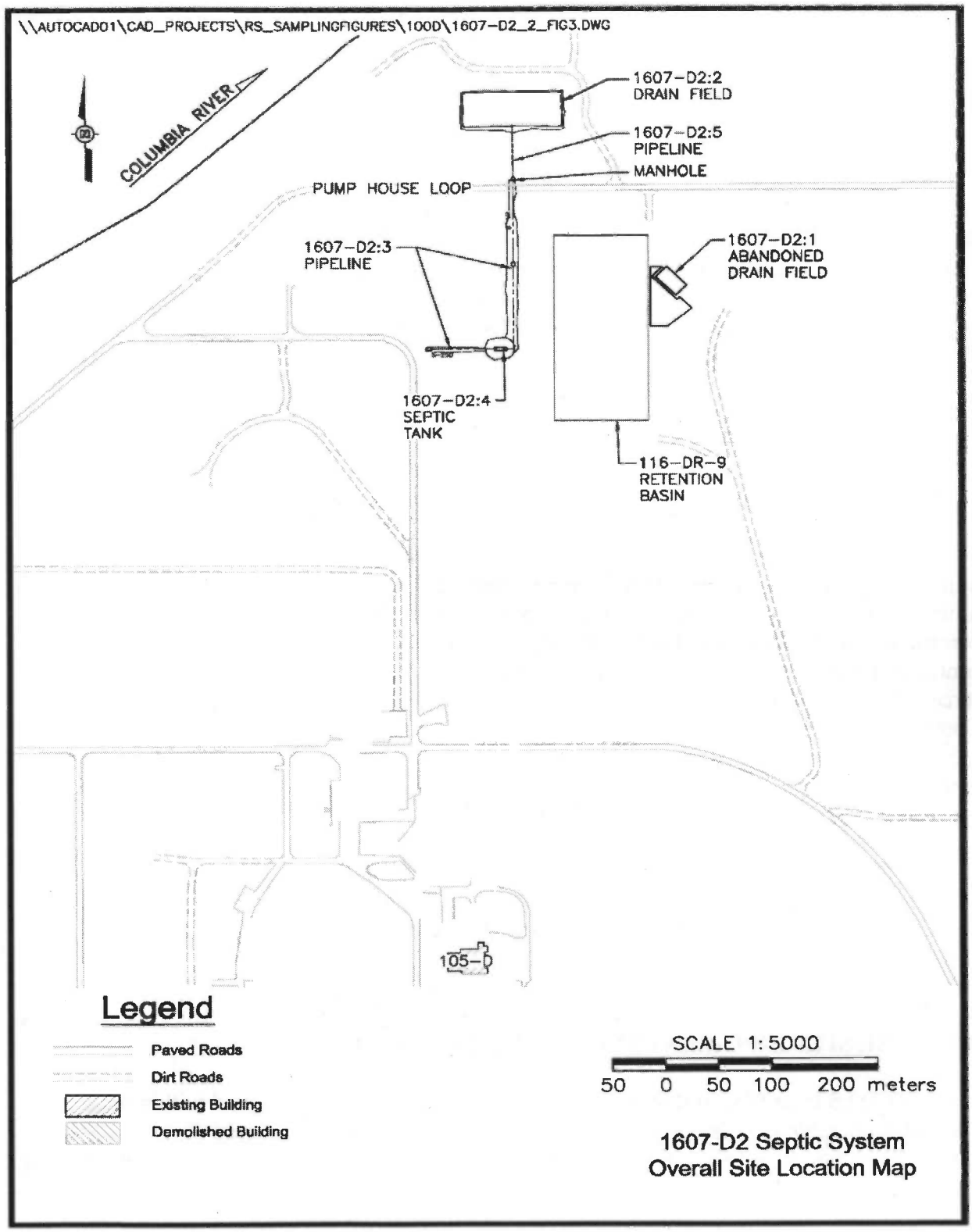
The 1607-D2:5 subsite cleanup verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record 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* (Remaining Sites ROD), (EPA 1999). The results of verification sampling and modeling 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. 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 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 1607-D2:5 subsite contaminants of potential concern (COPCs) and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, selenium, and vanadium. The U.S. Environmental Protection Agency (EPA) ecological soil-screening levels were exceeded for antimony, manganese, selenium, and vanadium. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of antimony, manganese, and vanadium are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 1607-D2:5 Inlet Pipe to Replacement System Tile Field subsite, located within the 100-DR-1 operable unit, is related to the 1607-D2:2 Replacement Tile Field, the 1607-D2:3 Septic Pipelines, and the 1607-D2:4 Septic Tank subsites (Figure 1). The 1607-D2:2 Replacement Drain Field was connected to the 1607-D2:4 Septic Tank via the 1607-D2:3 Septic Pipeline and the 1607-D2:5 subsite pipeline. The 1607-D2:5 subsite pipeline was left in place when the 1607-D2:2 Replacement Drain Field was removed in 2008 because pipelines for the 100-D Area pump-and-treat system covered this portion of the septage pipelines (WCH 2009).

Figure 1. 1607-D2:5 Subsite Location Map.



REMEDIAL ACTION SUMMARY

Remedial action at the 1607-D2:5 subsite was performed on April 22, 2014. The depth of the excavation extended approximately 1.5 m (5 ft) below ground surface (Figure 2) resulting in approximately 340 bank cubic meters (445 bank cubic yards) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility. The waste material was staged prior to loadout to the Environmental Restoration Disposal Facility; therefore, a waste staging pile area (SPA) was created. There is no overburden soil stockpile associated with the 1607-D2:5 subsite. No stained soil or anomalous materials were encountered during the remediation.

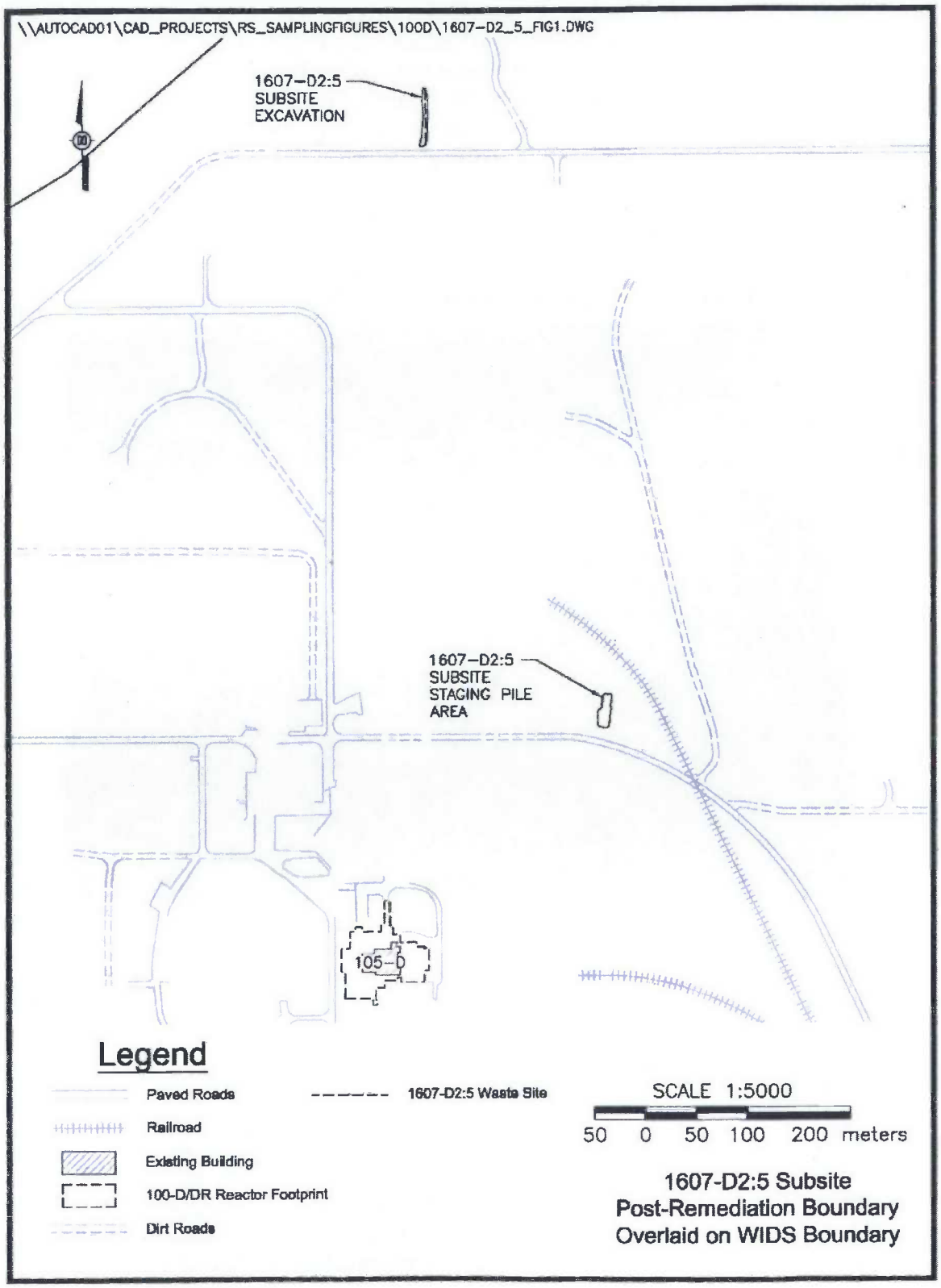
Figure 2. Photograph of the 1607-D2:5 Subsite Excavation.

A post-remediation boundary of the 1607-D2:5 subsite excavation and waste SPA was conducted following remedial action activities (Figure 3).

VERIFICATION SAMPLING ACTIVITIES

Per the *Work Instruction for Verification Sampling of the 1607-D2:5, Inlet Pipe to Replacement System Tile Field* (WCH 2014b), verification sampling started on June 26, 2014, within the excavation and July 29, 2014, for the SPA. Sampling was conducted to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999).

Figure 3. 1607-D2:5 Subsite Post-Excavation Boundary and Waste Staging Pile Area.



The verification sample results are provided in Appendix B and indicate that the waste removal action achieved compliance with the remedial action objectives and remedial action goals (RAGs) for the 1607-D2:5 subsite. The following subsections provide additional discussion of the information used to develop the verification sampling design. The statistical results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Potential Concern

The 1607-D2:5 subsite pipeline was used to pass septage to the 1607-D2:2 Replacement Drain Field. The 1607-D2 septic system received waste from the 1700-D, 1707-D, 1707-DA, 1708-D, 1713-D, 1716-D, 1717-D, 1718-D, 1719-D, 1722-D, 182-D, 183-D, 184-D, 185-D, 186-D, 189-D, 190-D, and 108-D Buildings (WCH 2010). The COPCs for the 1607-D2:5 subsite are based on field-screening activities and historical information from the 1607-D2:2, 1607-D2:3, and 1607-D2:4 subsites (WCH 2009, BHI 2000, BHI 1999). The COPCs identified for 1607-D2:5 subsite are the expanded list of inductively coupled plasma metals, mercury, hexavalent chromium, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAH), semivolatile organic compounds, nitrate, and inorganic anions.

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

Table 1. Laboratory Analytical Methods for the 1607-D2:5 Subsite.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Metals [a]
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
PAH – EPA Method 8310 [b]	Polycyclic aromatic hydrocarbons
IC anions [c] – EPA Method 300.0	Anions [c]
Nitrate/nitrite – EPA Method 353.2 [d]	Nitrate and nitrite
SVOA – EPA Method 8270	Semivolatile organic compounds
PCB – EPA Method 8082	Polychlorinated biphenyls

[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.
[b] Because Method 8310 is specifically meant to analyze for PAH, data from this method will be used preferentially over the Method 8270 data for evaluation of PAH analyses.
[c] IC anions analyses included bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.
[d] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353.2 was performed.

EPA = U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Verification Sample Design

Two decision units were identified for the 1607-D2:5 subsite; specifically, the excavation and the waste SPA. Twelve statistical soil samples were collected from each decision unit.

Additionally, one duplicate sample was collected from both the excavation and SPA decision units, and one equipment blank was collected for the 1607-D2:5 subsite.

All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2009a). All samples were grab samples collected at the predetermined coordinates.

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 and the sample locations are shown in Figures 4 and 5.

Table 2. 1607-D2:5 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
Excavation Area				
EXC-1	J1TW48	152392.9	573806.3	ICP metals [a], mercury, hexavalent chromium, IC anions [b], nitrate/nitrite [c], SVOA, PCB, PAH [d]
EXC-2	J1TW49	152397.5	573808.9	
EXC-3	J1TW50	152402.1	573806.3	
EXC-4	J1TW51	152406.7	573808.9	
EXC-5	J1TW52	152411.3	573811.6	
EXC-6	J1TW53	152415.9	573808.9	
EXC-7	J1TW54	152420.5	573811.6	
EXC-8	J1TW55	152425.1	573808.9	
EXC-9	J1TW56	152429.7	573811.6	
EXC-10	J1TW57	152434.3	573808.9	
EXC-11	J1TW58	152438.9	573806.3	
EXC-12	J1TW59	152443.5	573808.9	
Duplicate of J1TW48	J1TW60	152392.9	573806.3	
SPA Area				
SPA-1	J1TW61	151823.2	573980.0	ICP metals [a], mercury, hexavalent chromium, IC anions [b], nitrate/nitrite [c], SVOA, PCB, PAH [d]
SPA-2	J1TW62	151823.2	573985.8	
SPA-3	J1TW63	151828.2	573982.9	
SPA-4	J1TW64	151828.2	573988.7	
SPA-5	J1TW65	151833.2	573980.0	
SPA-6	J1TW66	151833.2	573985.8	
SPA-7	J1TW67	151833.2	573991.6	
SPA-8	J1TW68	151838.2	573982.9	
SPA-9	J1TW69	151838.2	573988.7	
SPA-10	J1TW70	151843.2	573985.8	
SPA-11	J1TW71	151843.2	573991.6	
SPA-12	J1TW72	151848.2	573988.7	
Duplicate of J1TW61	J1TW73	151823.2	573980.0	

Table 2. 1607-D2:5 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
Equipment blank	J1TW74	NA	NA	ICP metals [a], mercury and SVOA

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

[b] IC anions analyses included bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.

[c] To preclude holding time issues associated with EPA Method 300.0 for nitrates and nitrites, EPA Method 353.2 was performed.

[d] Because Method 8310 is specifically meant to analyze for PAH, data from this method was used preferentially over the Method 8270 data for evaluation of PAH analyses.

HEIS = Hanford Environmental Information System
EPA = U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Figure 4. 1607-D2:5 Subsite Excavation Verification Sample Locations.

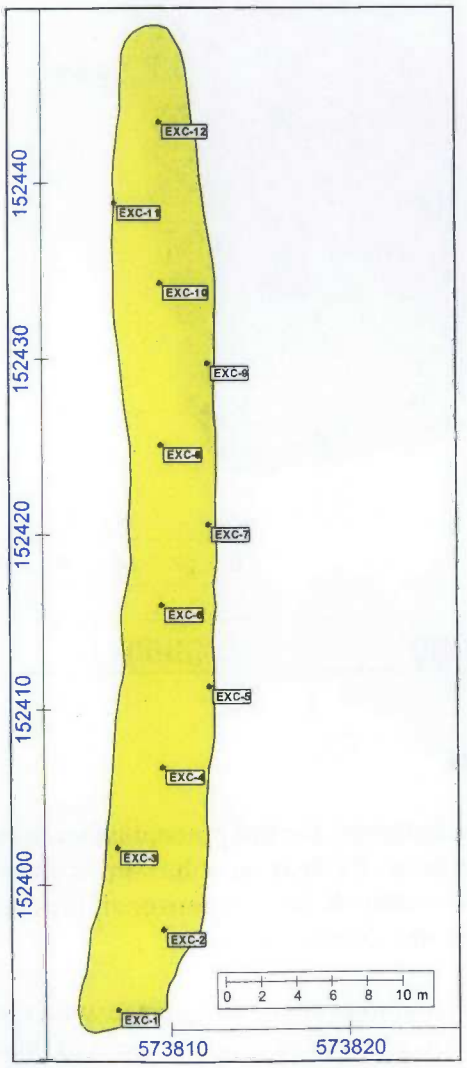
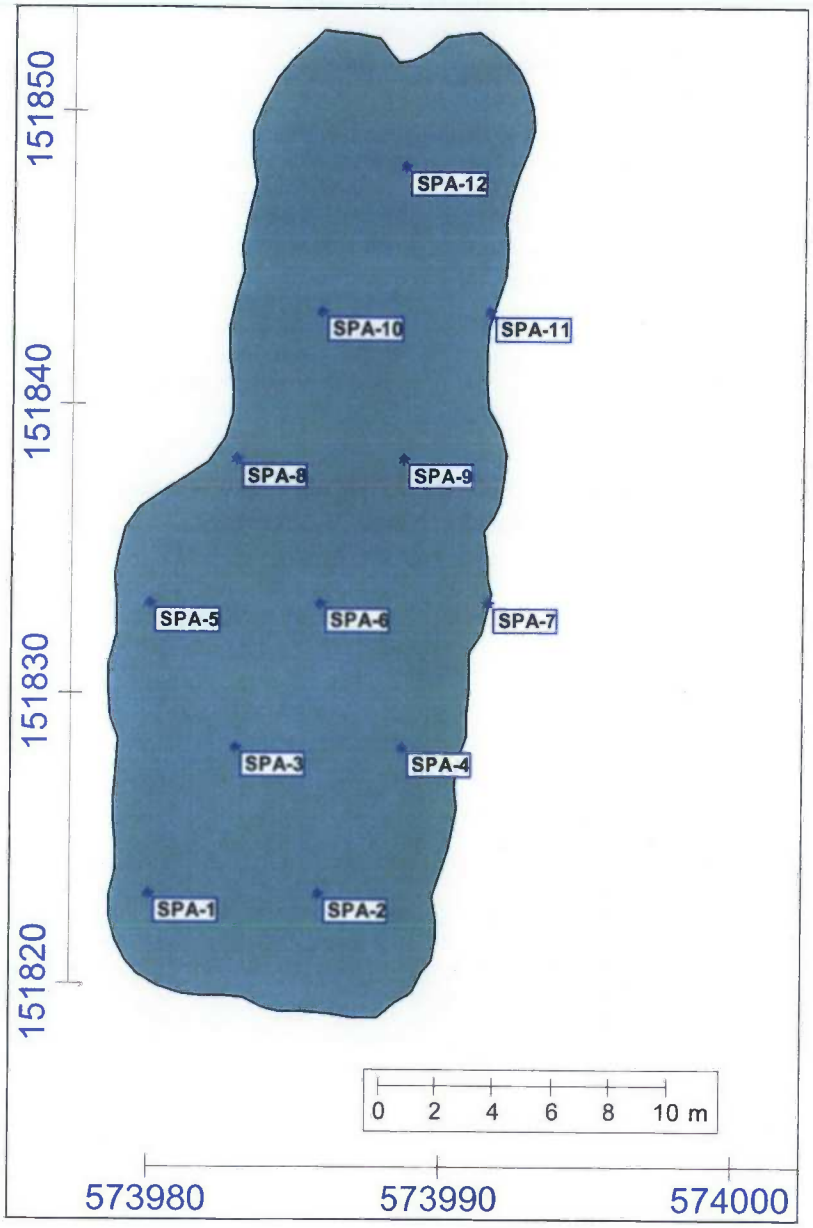


Figure 5. 1607-D2:5 Subsite Waste Staging Pile Area Verification Sample Locations.



Verification Sample Results

All verification samples were collected for full protocol laboratory analysis and analyzed using EPA-approved analytical methods. Evaluation of the verification data from the 1607-D2:5 subsite was performed by direct comparison of the statistical or maximum sample results for each COPC against the cleanup criteria.

The primary statistical calculation to evaluate compliance with cleanup standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for

each detected COPC are computed for the 1607-D2:5 subsite decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2009b). The calculations are provided in Appendix B. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the decision unit, the maximum detected value was used for comparison to the RAGs. If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC.

Comparisons of the results for each COPC from the 1607-D2:5 subsite against the RAGs are summarized in Tables 3 and 4. 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 2014) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations; therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in Tables 3 and 4.

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 1607-D2:5 Subsite Excavation Verification Samples. (2 Pages)

COPC	Statistical or 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		
Antimony	0.38 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.7 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	74.9 (<BG)	5,600	200	400	No	--
Beryllium	0.20 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	2.1	7,200	320	-- [f]	No	--
Cadmium [g]	0.18 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	10.2 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.282	2.1 [d]	4.8	2	No	--
Lead	4.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	339 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.021 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.53	400	8	-- [f]	No	--
Nickel	10.9 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	0.85	400	5	1	No	--
Vanadium	54.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	44.5 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	8.0 (<BG)	--	25,000	-- [f]	No	--
Fluoride	1.7 (<BG)	4,800	96	400	No	--

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 1607-D2:5 Subsite Excavation Verification Samples. (2 Pages)

COPC	Statistical or 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		
Nitrogen in nitrate	6.0 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	11.6 (<BG)	128,000	1,000	2,000	No	--
Sulfate	11.6 (<BG)	--	25,000	-- [f]	No	--
Benzo(a)anthracene	0.0055	1.37	0.015 [h]	0.015 [h]	No	--
Benzo(a)pyrene	0.0086	0.137	0.015 [h]	0.015 [h]	No	--
Benzo(b)fluoranthene	0.011	1.37	0.015 [h]	0.015 [h]	No	--
Chrysene	0.0062	13.7	0.12	0.1 [h]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The 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 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], Ecology 1996).
[e] No Hanford Site-specific or Washington State background value available.
[f] 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]).
[g] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

-- = not applicable
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 1607-D2:5 Subsite Waste Staging Pile Area Verification Samples. (2 Pages)

COPC	Statistical or 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		
Antimony	0.45 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	77.3 (<BG)	5,600	200	400	No	--
Beryllium	0.23 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.5	7,200	320	-- [f]	No	--

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 1607-D2:5 Subsite Waste Staging Pile Area Verification Samples. (2 Pages)

COPC	Statistical or 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		
Chromium	10.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.327	2.1 [d]	4.8	2	No	--
Lead	4.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	336 (<BG)	3,760	512 [c]	512	No	--
Mercury	0.012 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.45	400	8	-- [f]	No	--
Nickel	11.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	0.89	400	5	1	No	--
Vanadium	55.0 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	42.5 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	81.3 (<BG)	--	25,000	-- [f]	No	--
Fluoride	4.0	4,800	96	400	No	--
Nitrogen in nitrate	5.5 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	6.1 (<BG)	128,000	1,000	2,000	No	--
Sulfate	23.2 (<BG)	--	25,000	-- [f]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The 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 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], Ecology 1996).
[e] No Hanford Site-specific or Washington State background value available.
[f] 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]).
[g] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

-- = not applicable
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

The complete laboratory results for all constituents are stored in a Washington Closure Hanford project-specific database prior to archival in the Hanford Environmental Information System and are presented in Attachment 1 of the 95% UCL calculations (Appendix B).

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 1607-D2:5 subsite achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 100 Area RDR/RAWP (DOE-RL 2009b).

Attainment of Nonradionuclide RAGS

Tables 3 and 4 compare the cleanup verification sample values for the 1607-D2:5 subsite excavation and SPA 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 RAGs; therefore, the residual concentrations of all COPCs at the 1607-D2:5 subsite are predicted to be protective of groundwater and the Columbia River.

Three-Part Test for Nonradionuclides

A RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test, which consists of the following criteria: (1) the cleanup verification 95% UCL value must be less than the cleanup level, (2) no single detection shall exceed two times the cleanup criteria, and (3) the percentage of samples exceeding the cleanup criteria must be less than 10% of the data set.

The application of the three-part test for the 1607-D2:5 subsite is included in the *1607-D2:5 Subsite Cleanup Verification 95% UCL Calculation* in Appendix B of this remaining sites verification package, where half or more of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against all applicable RAGs; therefore, the residual concentrations of all COPCs at the 1607-D2:5 subsite are predicted to be protective of groundwater and the Columbia River.

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 1607-D2:5 subsite, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background.

All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 6.0×10^{-3}, which is less than 1.0. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1×10^{-6}, and the cumulative carcinogenic risk value is 2.3×10^{-7}, which is less than 1×10^{-5}. The 1607-D2:5 subsite meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100 Area RDR/RAWP (DOE-RL 2009b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 1607-D2:5 subsite included 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}. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for which there is no background value. In addition, the soil-partitioning coefficients for these contaminants must be less than that necessary to show no migration to groundwater in 1,000 years based on RESidual RADioactivity modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b). Based on this model and a vadose zone of approximately 13.5 m (45 ft) in thickness, a distribution coefficient of 5.6 or greater is required to show no predicted migration to groundwater in 1,000 years. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 1607-D2:5 subsite is 1.9×10^{-1}, which is less than 1.0. No carcinogenic constituents met the criteria for groundwater protection evaluation at the 1607-D2:5 subsite; therefore, no calculations of excess carcinogenic risk were performed and nonradionuclide risk requirements related to groundwater are met.

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 1607-D2:5 subsite 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 Washington Closure Hanford project-specific database for data evaluation prior to archival in the Hanford Environmental Information System and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 1607-D2:5 subsite has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009b). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at the site meet the remedial action objectives for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 1607-D2:5 subsite to Interim Closed Out. 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 sites are not required.

REFERENCES

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BHI, 2000, *Cleanup Verification Package for the 1607-D2 Septic Pipelines,* CVP-2000-00004, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

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

WCH, 2009, *Cleanup Verification Package for the 1607-D2:2 Replacement Drain Field,* CVP-2009-00006, Rev. 1, Washington Closure Hanford, Richland, Washington.

WCH, 2010, *Remaining Sites Verification Package for the 100-D-31:1, 1607-D2 Septic Sewer Pipeline and the 100-D-31:2, 1700-D Series Buildings Septic Sewer Pipelines*, Attachment to Waste Site Reclassification Forms 2010-005 and 2010-006, Washington Closure Hanford, Richland, Washington.

WCH, 2014a, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, pp. 46-50 and 74-77, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 1607-D2:5, Inlet Pipe to Replacement System Tile Field,* 0100D-WI-G0138, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 1607-D2:5 Subsite [a].

Hazardous Substance		2001 WAC 173-340 Table 749-3			EPA Ecological Soil-Screening Levels [b]				Maximum Result
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
	Background	Metals (mg/kg)							
Antimony	5	5	NA	NA	NA	78	NA	0.27	0.45 (<BG)
Boron	NA	0.5	NA	NA	NA	NA	NA	NA	2.1
Manganese	512	1,100 [d]	NA	1,500	220	450	4,300	4,000	339 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	0.89
Vanadium	85.1	2	NA	NA	NA	NA	7.8	280	55.0 (<BG)

NOTE: Shaded cells indicate screening values that are exceeded.

[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] Benchmark replaced by Washington state natural background concentration from Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State*, Publication 94-115, Washington State Department of Ecology, Olympia, Washington.

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

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATION BRIEFS

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 calculations provided in this appendix include:

1607-D2:5 Subsite Cleanup Verification 95% UCL Calculation, 0100D-CA-V0549, Rev. 0, Washington Closure Hanford, Richland, Washington.

1607-D2:5 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0550, Rev. 0, Washington Closure Hanford, Richland, Washington.

1607-D2:5 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100D-CA-V0551, 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.

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CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0549

Subject: 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculation

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 Sheets = 19 Attm. 1 = 14 Total = 34	J. D. Skoglie	I. B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	10/27/14

SUMMARY OF REVISION

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 09/11/14	**Calc. No.** 0100D-CA-V0549		**Rev. No.** 0	
Project 100-D Field Remediation	**Job No.** 14655	**Checked** I. B. Berezovskiy		**Date** 09/11/14	
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations				**Sheet No.** 1 of 19	

Summary

Purpose:
Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the subject site. Also, perform the *Washington Administrative Code* (WAC) 173-340-740(7)(e) Model Toxics Control Act (MTCA) 3-part test for nonradionuclide analytes and calculate the relative percent difference (RPD) for primary-duplicate sample pairs for each contaminant of concern (COC) and contaminant of potential concern (COPC), as necessary.

Table of Contents:
Sheets 1 to 4 - Calculation Sheet Summary
Sheets 5 to 12 - Statistical/Maximum Sheets Verification Data Results - Excavation and Staging Pile Area
Sheets 13 to 18 - Ecology Software (MTCAStat) Results
Sheet 19 - Calculation Sheet Duplicate Analysis
Attachment 1 - 1607-D2:5 Subste, Verification Sampling Results (14 pages)

Given/References:
1) Sample Results (Attachment 1).
2) 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.
3) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
5) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets),* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
6) Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
7) EPA, 1989, *Risk Assessment Guidance for Superfund:* Volume 1, *Human Health Evaluation Manual, Part A; Interim Final,* EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D. C.
8) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code,*

Solution:
Calculation methodology is described in Ecology Pub. #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2009b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, the WAC 173-340-740(7)(e) 3-part test for nonradionuclides, and the RPD calculations for each COC/COPC. The hazard quotient and carcinogenic risk calculations are located in a separate calculation brief as an appendix to the Remaining Sites Verification Package (RSVP).

Calculation Description:
The subject calculations were performed on statistical and maximum data from soil verification samples (Attachment 1) from the 1607-D2:5 subsite. The data were entered into an EXCEL 2010 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2009b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
The 1607-D2:5 subsite underwent statistical sampling at 2 decision units for verification sampling; excavation and staging pile area. Analytical results for all sampling locations are summarized in the tables provided on sheet 4. Further information of the sample data quality is presented in the data quality assessment section of the associated RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 09/11/14	**Calc. No.** 0100D-CA-V0549		**Rev. No.**	0
Project 100-D Field Remediation	**Job No.** 14655	**Checked** I. B. Berezovskiy		**Date**	09/11/14
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations				**Sheet No.**	2 of 19

Summary (continued)

Methodology, continued:

For nonradioactive analytes with ≤50% of the data below detection limits, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, as determined by direct inspection of the sample results (Attachment 1), the maximum detected value for the data set is used instead of the 95% UCL, and no further calculations are performed for those data sets. For convenience, these maximum detected values are included in the summary tables that follow. The 95% UCL was not calculated for data sets with no reported detections. Calculated cleanup levels are not available in Ecology (2011) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance* for Superfund (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COCs/COPCs and are also not included in these calculations.

All nonradionuclide data reported as being undetected are set to ½ the detection limit value for calculation of the statistics (Ecology 1993). For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above. For radionuclide data, calculation of the statistics is done using the reported value. In cases where the laboratory does not report a value below the minimum detectable activity (MDA), half of the MDA is used in the calculation. For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above.

For nonradionuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% UCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets (n<10), the calculations are performed assuming nonparametric distribution, so no tests for distribution are performed. For nonradionuclide data sets of ten or greater, as for the subject site, distributional testing is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2009b) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting data set treated as uncensored.

The WAC 173-340-740(7)(e) 3-part test is performed for nonradionuclide analytes only and determines if:
1) the 95% UCL exceeds the most stringent cleanup limit for each COPC/COC,
2) greater than 10% of the raw data exceed the most stringent cleanup limit for each COPC/COC,
3) the maximum value of the raw data set exceeds two times the most stringent cleanup limit for each COPC/COC.

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 TDLs are pre-determined values for analytical methods and constituents with cleanup levels as listed in Table 2-1 of the SAP (DOE-RL 2009a). Table 2-1 includes nominal TDLs for identified methods based organic analyses. The nominal TDLs are also used in support of the RPD calculation for the methods based analytes. TDLs not included in Table 2-1 are based on the laboratory and/or methods 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:

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

where, M = Main Sample Value S = Split (or duplicate) Sample Value

For quality assurance/quality control (QA/QC) split and 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. To assist in the identification of anomalous sample pairs, 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. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 09/11/14	**Calc. No.** 0100D-CA-V0549	**Rev. No.** 0
Project 100-D Field Remediation	**Job No.** 14655	**Checked** I. B. Berezovskiy	**Date** 09/11/14
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations			**Sheet No.** 3 of 19

Summary (continued)

QUALIFIER LIST

B = estimated result. Result is less than the RL but greater than the MDL
J = estimate
M = sample duplicate precision not met
N = recovery is outside control limits
U = undetected
X = serial dilution in the analytical batch indicates that physical and chemical interferences are present

ACRONYM LIST

-- = not applicable
DE = direct exposure
EXC = excavation
GW = groundwater
MTCA = *Model Toxics Control Act*
PQL = practical quantitation limit
Q = qualifier
QA/QC = quality assurance/quality control
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
RPD = relative percent difference
RSVP = remaining sites verification package
SAP = sampling and analysis plan
SPA = staging pile area
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie Date 09/11/14 Calc. No. 0100D-CA-V0549 Rev. No. 0
Project 100-D Field Remediation Job No. 14655 Checked I. B. Berezovskiy Date 09/11/14
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations Sheet No. 4 of 19

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations and/or maximum for the decision units EXC , SPA, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary [a]

Analyte	EXC		SPA		UNITS
	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	
Antimony	--	0.38	0.45	--	mg/kg
Arsenic	2.7	--	2.6	--	mg/kg
Barium	74.9	--	77.3	--	mg/kg
Beryllium	0.20	--	0.23	--	mg/kg
Boron	2.1	--	1.5	--	mg/kg
Cadmium	0.18	--	--	--	mg/kg
Chromium	10.2	--	10.5	--	mg/kg
Cobalt	8.6	--	8.6	--	mg/kg
Copper	15.9	--	15.9	--	mg/kg
Hexavalent chromium	--	0.282	0.327	--	mg/kg
Lead	4.9	--	4.9	--	mg/kg
Manganese	339	--	336	--	mg/kg
Mercury	0.021	--	0.012	--	mg/kg
Molybdenum	--	0.53	--	0.45	mg/kg
Nickel	10.9	--	11.7	--	mg/kg
Selenium	--	0.85	--	0.89	mg/kg
Vanadium	54.8	--	55.0	--	mg/kg
Zinc	44.5	--	42.5	--	mg/kg
Chloride	8.0	--	81.3	--	mg/kg
Fluoride	1.7	--	4.0	--	mg/kg
Nitrogen in nitrate	6.0	--	5.5	--	mg/kg
Nitrogen in nitrate and nitrite	11.6	--	6.1	--	mg/kg
Sulfate	11.6	--	23.2	--	mg/kg
Benzo(a)anthracene	--	0.0055	--	--	mg/kg
Benzo(a)pyrene	--	0.0086	--	--	mg/kg
Benzo(b)fluornathene	--	0.011	--	--	mg/kg
Chrysene	--	0.0062	--	--	mg/kg

WAC 173-340-740(7)(e) Evaluation:
WAC 173-340 3-Part Test for most stringent RAG:

	EXC		SPA	
95% UCL or maximum> Cleanup Limit?	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO
Any sample > 2x Cleanup Limit?	NO	NO	NO	NO

[a] The 95% UCL result or maximum value, depending on data censorship, as described in the methodology section.

Relative Percent Difference Results and QA/QC Analysis [a]

Analyte	Duplicate Analysis	
	EXC	SPA
Aluminum	8.8%	1.7%
Barium	8.0%	9.2%
Calcium	1.9%	3.9%
Chromium	3.3%	6.2%
Copper	2.9%	0.7%
Iron	0.9%	4.2%
Magnesium	1.3%	1.7%
Manganese	6.9%	11.5%
Silicon	2.7%	9.3%
Vanadium	4.1%	2.8%
Zinc	0.7%	2.9%
Chloride	4.7%	--
Nitrogen in nitrate	4.3%	--
Nitrogen in nitrate and nitrite	19.1%	--

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 04/07/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 04/07/14
Sheet No. 5 of 19

1607-D2:5 Subsite Statistical Calculations
Verification Data - Decision Unit - EXC

Sample Area	Sample Number	Sample Date	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper			Lead		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	3.0		0.58	72.0	X	0.067	0.20		0.029	2.0		0.86	0.18		0.036	9.0	X	0.051	8.0	X	0.088	13.6		0.19	5.1		0.24
Duplicate of J1TW48	J1TW60	6/26/14	2.8		0.65	78.0	X	0.075	0.20		0.033	1.7	B	0.97	0.15	B	0.041	9.3	X	0.057	7.9	X	0.099	14.0		0.22	5.3		0.27
EXC-2	J1TW49	6/26/14	2.5		0.65	65.6	X	0.075	0.19	B	0.032	1.7	B	0.97	0.15	B	0.040	9.2	X	0.057	7.6	X	0.098	14.0		0.21	4.7		0.27
EXC-3	J1TW50	6/26/14	1.1		0.63	48.3	X	0.072	0.043	B	0.031	0.93	U	0.93	0.14	B	0.039	3.4	X	0.055	9.0	X	0.095	13.4		0.21	2.8		0.26
EXC-4	J1TW51	6/26/14	1.6		0.66	50.4	X	0.076	0.13	B	0.033	1.2	B	0.98	0.16	B	0.041	4.9	X	0.058	8.2	X	0.10	16.4		0.22	3.6		0.27
EXC-5	J1TW52	6/26/14	2.5		0.66	82.4	X	0.075	0.18	B	0.033	3.1		0.97	0.16	B	0.041	7.8	X	0.058	8.8	X	0.099	16.1		0.22	4.6		0.27
EXC-6	J1TW53	6/26/14	2.5		0.65	64.2	X	0.075	0.18	B	0.032	1.0	B	0.96	0.21		0.040	8.9	X	0.057	8.4	X	0.098	14.6		0.21	4.2		0.27
EXC-7	J1TW54	6/26/14	1.6		0.56	54.1	X	0.065	0.098	B	0.028	0.95	B	0.84	0.15	B	0.035	5.8	X	0.050	8.3	X	0.085	14.7		0.19	3.3		0.23
EXC-8	J1TW55	6/26/14	2.7		0.66	65.2	X	0.076	0.20		0.033	1.6	B	0.98	0.22		0.041	9.9	X	0.058	8.7	X	0.10	17.5		0.22	5.0		0.27
EXC-9	J1TW56	6/26/14	1.7		0.58	45.0	X	0.067	0.10	B	0.029	0.87	U	0.87	0.15	B	0.036	4.7	X	0.051	7.8	X	0.088	14.2		0.19	3.0		0.24
EXC-10	J1TW57	6/26/14	3.3		0.65	81.9	X	0.075	0.30		0.032	1.7	B	0.96	0.19	B	0.040	14.0	X	0.057	8.7	X	0.098	16.2		0.21	5.6		0.27
EXC-11	J1TW58	6/26/14	2.6		0.66	70.5	X	0.075	0.23		0.033	1.4	B	0.97	0.17	B	0.041	9.7	X	0.058	8.7	X	0.099	16.0		0.22	4.8		0.27
EXC-12	J1TW59	6/26/14	2.8		0.63	88.0	X	0.073	0.17	B	0.032	0.94	U	0.94	0.15	B	0.039	7.9	X	0.056	8.3	X	0.096	15.5		0.21	4.4		0.26

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Lead mg/kg
EXC-1	J1TW48/ J1TW60	6/26/14	2.9	75.0	0.20	1.9	0.17	9.2	8.0	13.8	5.2
EXC-2	J1TW49	6/26/14	2.5	65.6	0.19	1.7	0.15	9.2	7.6	14.0	4.7
EXC-3	J1TW50	6/26/14	1.1	48.3	0.043	0.47	0.14	3.4	9.0	13.4	2.8
EXC-4	J1TW51	6/26/14	1.6	50.4	0.13	1.2	0.16	4.9	8.2	16.4	3.6
EXC-5	J1TW52	6/26/14	2.5	82.4	0.18	3.1	0.16	7.8	8.8	16.1	4.6
EXC-6	J1TW53	6/26/14	2.5	64.2	0.18	1.0	0.21	8.9	8.4	14.6	4.2
EXC-7	J1TW54	6/26/14	1.6	54.1	0.10	0.95	0.15	5.8	8.3	14.7	3.3
EXC-8	J1TW55	6/26/14	2.7	65.2	0.20	1.6	0.22	9.9	8.7	17.5	5.0
EXC-9	J1TW56	6/26/14	1.7	45.0	0.10	0.44	0.15	4.7	7.8	14.2	3.0
EXC-10	J1TW57	6/26/14	3.3	81.9	0.30	1.7	0.19	14.0	8.7	16.2	5.6
EXC-11	J1TW58	6/26/14	2.6	70.5	0.23	1.4	0.17	9.7	8.7	16.0	4.8
EXC-12	J1TW59	6/26/14	2.8	88.0	0.17	0.47	0.15	7.9	8.3	15.5	4.4

Statistical Computations

	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Lead
95% UCL based on	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	25%	0%	0%	0%	0%	0%
Mean	2.3	65.9	0.17	1.3	0.17	7.9	8.4	15.2	4.3
Standard deviation	0.66	14.3	0.068	0.76	0.026	2.9	0.43	1.3	0.90
95% UCL on mean	2.7	74.9	0.20	2.1	0.18	10.2	8.6	15.9	4.9
Maximum value	3.3	88.0	0.30	3.1	0.22	14.0	9.0	17.5	5.6
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	10.2 GW & River Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA
WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 04/07/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 04/07/14
Sheet No. 6 of 19

1607-D2:5 Subsite Statistical Calculations
Verification Data - Decision Unit - EXC

1	Sample	Sample	Sample	Manganese			Mercury			Nickel			Vanadium			Zinc			Chloride			Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate		
2	Area	Number	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	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	EXC-1	J1TW48	6/26/14	321	X	0.088	0.0063	B	0.0053	10.2	X	0.11	49.8		0.083	43.2	X	0.35	10.3	N	1.9	1.2	JBN	0.79	9.2	JN	0.30	10.3		0.36
4	Duplicate of J1TW48	J1TW60	6/26/14	344	X	0.099	0.0059	B	0.0053	10.8	X	0.12	47.8		0.093	42.9	X	0.39	10.8	N	1.9	1.6	JBN	0.80	9.6	JN	0.31	8.5		0.36
5	EXC-2	J1TW49	6/26/14	290	X	0.098	0.012	B	0.0053	10.0	X	0.12	46.1		0.093	42.6	X	0.39	6.4		2.0	1.4	JB	0.81	2.3	JB	0.31	2.1		0.36
6	EXC-3	J1TW50	6/26/14	294	X	0.095	0.0055	U	0.0055	7.2	X	0.12	59.8		0.090	41.5	X	0.38	5.5		1.9	0.92	JB	0.78	1.2	JB	0.30	0.36	U	0.36
7	EXC-4	J1TW51	6/26/14	262	X	0.10	0.0055	B	0.0052	8.7	X	0.12	49.7		0.094	40.5	X	0.40	6.5		2.0	1.3	JB	0.82	4.9	J	0.31	3.1		0.36
8	EXC-5	J1TW52	6/26/14	345	X	0.099	0.0081	B	0.0054	10.4	X	0.12	55.4		0.093	45.6	X	0.40	11.0		2.0	1.8	JB	0.82	9.7	J	0.31	8.3		0.36
9	EXC-6	J1TW53	6/26/14	309	X	0.098	0.0053	U	0.0053	9.2	X	0.12	57.0		0.093	44.5	X	0.39	7.0		2.0	1.7	JB	0.81	2.3	JB	0.31	1.4		0.36
10	EXC-7	J1TW54	6/26/14	278	X	0.085	0.0051	U	0.0051	8.7	X	0.11	56.0		0.080	40.9	X	0.34	5.8		2.0	1.4	JB	0.81	1.5	JB	0.31	0.48	B	0.36
11	EXC-8	J1TW55	6/26/14	322	X	0.10	0.077		0.0052	11.2	X	0.12	54.8		0.094	48.5	X	0.40	6.5		2.0	1.7	JB	0.82	2.5	J	0.31	2.5		0.36
12	EXC-9	J1TW56	6/26/14	282	X	0.088	0.0055	U	0.0055	6.9	X	0.11	54.5		0.083	38.6	X	0.35	6.0		1.9	1.1	JB	0.79	1.8	JB	0.30	0.61	BM	0.36
13	EXC-10	J1TW57	6/26/14	359	X	0.098	0.0067	B	0.0054	13.7	X	0.12	48.7		0.093	45.5	X	0.39	5.6		1.9	1.7	JB	0.78	1.1	JB	0.30	0.49	B	0.36
14	EXC-11	J1TW58	6/26/14	353	X	0.099	0.0074	B	0.0056	11.1	X	0.12	50.7		0.093	44.7	X	0.40	7.5		2.0	1.9	JB	0.82	2.5	J	0.31	1.2		0.36
15	EXC-12	J1TW59	6/26/14	385	X	0.096	0.0056	B	0.0055	9.7	X	0.12	46.7		0.090	38.8	X	0.38	6.8		2.0	1.4	JB	0.81	0.93	JB	0.31	0.36	U	0.36

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Manganese	Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	EXC-1	J1TW48/ J1TW60	6/26/14	333	0.0061	10.5	48.8	43.1	10.6	1.4	9.4	9.4
20	EXC-2	J1TW49	6/26/14	290	0.012	10.0	46.1	42.6	6.4	1.4	2.3	2.1
21	EXC-3	J1TW50	6/26/14	294	0.0028	7.2	59.8	41.5	5.5	0.92	1.2	0.18
22	EXC-4	J1TW51	6/26/14	262	0.0055	8.7	49.7	40.5	6.5	1.3	4.9	3.1
23	EXC-5	J1TW52	6/26/14	345	0.0081	10.4	55.4	45.6	11.0	1.8	9.7	8.3
24	EXC-6	J1TW53	6/26/14	309	0.0027	9.2	57.0	44.5	7.0	1.7	2.3	1.4
25	EXC-7	J1TW54	6/26/14	278	0.0026	8.7	56.0	40.9	5.8	1.4	1.5	0.48
26	EXC-8	J1TW55	6/26/14	322	0.077	11.2	54.8	48.5	6.5	1.7	2.5	2.5
27	EXC-9	J1TW56	6/26/14	282	0.0028	6.9	54.5	38.6	6.0	1.1	1.8	0.61
28	EXC-10	J1TW57	6/26/14	359	0.0067	13.7	48.7	45.5	5.6	1.7	1.1	0.49
29	EXC-11	J1TW58	6/26/14	353	0.0074	11.1	50.7	44.7	7.5	1.9	2.5	1.2
30	EXC-12	J1TW59	6/26/14	385	0.0056	9.7	46.7	38.8	6.8	1.4	0.93	0.18

31 **Statistical Computations**

32		Manganese	Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate
33	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
34	N	12	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	33%	0%	0%	0%	0%	0%	0%	17%
36	Mean	318	0.012	9.8	52.4	42.9	7.1	1.5	3.3	2.5
37	Standard deviation	37.9	0.021	1.9	4.4	3.0	1.8	0.29	3.1	3.1
38	95% UCL on mean	339	0.021	10.9	54.8	44.5	8.0	1.7	6.0	11.6
39	Maximum value	385	0.077	13.7	59.8	48.5	11.0	1.9	9.7	10.3
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	512 GW & River Protection	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25,000 GW Protection	96 GW Protection	1,000 GW Protection	1,000 GW Protection
41	**WAC 173-340 3-PART TEST**									
42	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.

46 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 04/07/14 **Calc. No.** 0100D-CA-V0549 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 04/07/14
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 7 of 19

1607-D2:5 Subsite Statistical Calculations
Verification Data - Decision Unit - EXC

	Sample Area	Sample Number	Sample Date	Sulfate mg/kg	Q	PQL
1						
2						
3	EXC-1	J1TW48	6/26/14	10.1	JN	1.6
4	Duplicate of J1TW48	J1TW60	6/26/14	10.7	JN	1.7
5	EXC-2	J1TW49	6/26/14	5.2	J	1.7
6	EXC-3	J1TW50	6/26/14	3.6	JB	1.6
7	EXC-4	J1TW51	6/26/14	5.9	J	1.7
8	EXC-5	J1TW52	6/26/14	9.1	J	1.7
9	EXC-6	J1TW53	6/26/14	7.7	J	1.7
10	EXC-7	J1TW54	6/26/14	4.3	JB	1.7
11	EXC-8	J1TW55	6/26/14	6.7	J	1.7
12	EXC-9	J1TW56	6/26/14	6.0	J	1.6
13	EXC-10	J1TW57	6/26/14	4.2	JB	1.6
14	EXC-11	J1TW58	6/26/14	6.8	J	1.7
15	EXC-12	J1TW59	6/26/14	29.5	J	1.7

16 **Statistical Computation Input Data**

	Sample Area	Sample Number	Sample Date	Sulfate mg/kg		
17						
18						
19	EXC-1	J1TW48/ J1TW60	6/26/14	10.4		
20	EXC-2	J1TW49	6/26/14	5.2		
21	EXC-3	J1TW50	6/26/14	3.6		
22	EXC-4	J1TW51	6/26/14	5.9		
23	EXC-5	J1TW52	6/26/14	9.1		
24	EXC-6	J1TW53	6/26/14	7.7		
25	EXC-7	J1TW54	6/26/14	4.3		
26	EXC-8	J1TW55	6/26/14	6.7		
27	EXC-9	J1TW56	6/26/14	6.0		
28	EXC-10	J1TW57	6/26/14	4.2		
29	EXC-11	J1TW58	6/26/14	6.8		
30	EXC-12	J1TW59	6/26/14	29.5		

31 **Statistical Computations**

		Sulfate		
32				
33	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.		
34	N	12		
35	% < Detection limit	0%		
36	Mean	8.3		
37	Standard deviation	7.0		
38	95% UCL on mean	11.6		
39	Maximum value	29.5		
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	25000	GW Protection	
41	**WAC 173-340 3-PART TEST**			
42	95% UCL > Cleanup Limit?	NA		
43	> 10% above Cleanup Limit?	NA		
44	Any sample > 2X Cleanup Limit?	NA		
45	**WAC 173-340 Compliance?**	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.		

46 **Acronyms and qualifiers are defined on sheet 3.**

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 09/11/14 **Calc. No.** 0100D-CA-V0549 **Rev. No.** 0

Project 100-D Field Remediation **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 09/11/14

Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 8 of 19

1 **1607-D2:5 Subsite Maximum Calculations**

2 **Verification Data - Decision Unit - EXC**

3	Sample	Sample	Sample	Antimony			Hexavalent Chromium			Molybdenum			Selenium			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Chrysene		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	EXC-1	J1TW48	6/26/14	0.33	UJ	0.33	0.155	UJ	0.155	0.53	B	0.23	0.76	U	0.76	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	4.7	U	4.7
6	Duplicate of J1TW48	J1TW60	6/26/14	0.38	UJ	0.38	0.155	UJ	0.155	0.26	U	0.26	0.85	U	0.85	5.5	JX	3.1	8.6	JX	6.2	11	JX	4.0	6.2	J	4.7
7	EXC-2	J1TW49	6/26/14	0.37	UJ	0.37	0.155	UJ	0.155	0.48	B	0.26	0.85	B	0.85	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	4.8	U	4.8
8	EXC-3	J1TW50	6/26/14	0.36	UJ	0.36	0.199	J	0.155	0.25	U	0.25	0.82	U	0.82	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	4.9	U	4.9
9	EXC-4	J1TW51	6/26/14	0.38	UJ	0.38	0.155	UJ	0.155	0.26	U	0.26	0.86	U	0.86	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	4.7	U	4.7
10	EXC-5	J1TW52	6/26/14	0.38	UJ	0.38	0.155	UJ	0.155	0.26	U	0.26	0.85	U	0.85	3.1	U	3.1	6.3	U	6.3	4.1	U	4.1	4.8	U	4.8
11	EXC-6	J1TW53	6/26/14	0.37	UJ	0.37	0.282	J	0.155	0.26	U	0.26	0.85	U	0.85	3.0	U	3.0	6.1	U	6.1	4.0	U	4.0	4.6	U	4.6
12	EXC-7	J1TW54	6/26/14	0.38	JB	0.32	0.199	J	0.155	0.22	U	0.22	0.74	U	0.74	3.1	U	3.1	6.2	U	6.2	4.0	U	4.0	4.7	U	4.7
13	EXC-8	J1TW55	6/26/14	0.38	UJ	0.38	0.155	UJ	0.155	0.26	U	0.26	0.86	U	0.86	3.1	U	3.1	6.3	U	6.3	4.1	U	4.1	4.8	U	4.8
14	EXC-9	J1TW56	6/26/14	0.34	UJ	0.34	0.155	UJ	0.155	0.23	U	0.23	0.76	U	0.76	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	4.8	U	4.8
15	EXC-10	J1TW57	6/26/14	0.37	UJ	0.37	0.155	UJ	0.155	0.26	U	0.26	0.85	U	0.85	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	4.8	U	4.8
16	EXC-11	J1TW58	6/26/14	0.38	UJ	0.38	0.155	UJ	0.155	0.26	U	0.26	0.85	U	0.85	3.2	U	3.2	6.5	U	6.5	4.2	U	4.2	4.9	U	4.9
17	EXC-12	J1TW59	6/26/14	0.37	UJ	0.37	0.220	J	0.155	0.25	U	0.25	0.83	U	0.83	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	4.9	U	4.9

18 **Statistical Computations**

19		Antimony	Hexavalent Chromium	Molybdenum	Selenium	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene
20	% < Detection limit	92%	69%	85%	92%	92%	92%	92%	92%
21	Maximum value	0.38	0.282	0.53	0.85	5.5	8.6	11	6.2
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	5 GW & River Protection	2 River Protection	8 GW Protection	1 River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection
23	**3-PART TEST**								
24	Maximum > Cleanup Limit?	NA	NO	NO	NO	NO	NO	NO	NO
25	> 10% above Cleanup Limit?	NA	NO	NO	NO	NO	NO	NO	NO
26	Any sample > 2X Cleanup Limit?	NA	NO	NO	NO	NO	NO	NO	NO
27	**3-Part Test Compliance?**	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

28 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 04/07/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 04/07/14
Sheet No. 9 of 19

1607-D2:5 Subsite Statistical Calculations
Verification Data - Decision Unit - SPA

Sample Area	Sample Number	Sample Date	Antimony mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL
SPA-1	J1TW61	7/29/14	0.55		0.34	2.8		0.59	82.8		0.068	0.21		0.03	1.4	B	0.88	9.4	X	0.052	8.4	X	0.090	14.4		0.19	0.266		0.155
Duplicate of J1TW61	J1TW73	7/29/14	0.33	U	0.33	2.7		0.57	75.5		0.066	0.22		0.029	0.85	U	0.85	10.0	X	0.050	8.4	X	0.087	14.3		0.19	0.367		0.155
SPA-2	J1TW62	7/29/14	0.47	B	0.35	3.1		0.60	84.0		0.070	0.28		0.030	2.2		0.90	11.4	X	0.053	8.0	X	0.092	13.9		0.20	0.155	U	0.155
SPA-3	J1TW63	7/29/14	0.50	B	0.33	2.1		0.58	72.2		0.066	0.20		0.029	0.99	B	0.85	7.7	X	0.051	8.4	X	0.087	15.6		0.19	0.245		0.155
SPA-4	J1TW64	7/29/14	0.37	B	0.35	2.4		0.61	67.1		0.070	0.20		0.030	1.1	B	0.90	9.5	X	0.053	8.1	X	0.092	13.2		0.20	0.283		0.155
SPA-5	J1TW65	7/29/14	0.41	B	0.36	1.6		0.62	63.1		0.071	0.16	B	0.031	0.92	U	0.92	7.9	X	0.055	8.5	X	0.094	14.2		0.20	0.288		0.155
SPA-6	J1TW66	7/29/14	0.42	B	0.33	2.6		0.58	65.9		0.067	0.18		0.029	0.86	U	0.86	9.4	X	0.051	8.5	X	0.088	13.8		0.19	0.324		0.155
SPA-7	J1TW67	7/29/14	0.53	B	0.35	2.4		0.61	72.2		0.071	0.21		0.031	1.0	B	0.91	11.2	X	0.054	8.6	X	0.093	14.3		0.20	0.304		0.155
SPA-8	J1TW68	7/29/14	0.42	B	0.36	2.3		0.62	71.4		0.071	0.19		0.031	0.92	U	0.92	10.1	X	0.055	8.5	X	0.094	14.6		0.20	0.304		0.155
SPA-9	J1TW69	7/29/14	0.33	U	0.33	2.1		0.57	60.9		0.066	0.17		0.028	0.85	U	0.85	8.5	X	0.050	8.4	X	0.086	15.8		0.19	0.283		0.155
SPA-10	J1TW70	7/29/14	0.37	U	0.37	1.9		0.65	69.4		0.075	0.16	B	0.032	1.3	B	0.96	9.4	X	0.057	7.9	X	0.098	20.5		0.21	0.155	U	0.155
SPA-11	J1TW71	7/29/14	0.51	B	0.37	2.4		0.64	83.1		0.073	0.26		0.032	1.2	B	0.94	11.0	X	0.056	9.3	X	0.096	15.3		0.21	0.367		0.155
SPA-12	J1TW72	7/29/14	0.35	U	0.35	2.6		0.61	84.6		0.071	0.25		0.031	1.8	B	0.91	10.9	X	0.054	8.7	X	0.093	14.0		0.20	0.450		0.155

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Hexavalent Chromium mg/kg
SPA-1	J1TW61/ J1TW73	7/29/14	0.36	2.8	79.2	0.22	0.91	9.7	8.4	14.4	0.317
SPA-2	J1TW62	7/29/14	0.47	3.1	84.0	0.28	2.2	11.4	8.0	13.9	0.0775
SPA-3	J1TW63	7/29/14	0.50	2.1	72.2	0.20	0.99	7.7	8.4	15.6	0.245
SPA-4	J1TW64	7/29/14	0.37	2.4	67.1	0.20	1.1	9.5	8.1	13.2	0.283
SPA-5	J1TW65	7/29/14	0.41	1.6	63.1	0.16	0.46	7.9	8.5	14.2	0.288
SPA-6	J1TW66	7/29/14	0.42	2.6	65.9	0.18	0.43	9.4	8.5	13.8	0.324
SPA-7	J1TW67	7/29/14	0.53	2.4	72.2	0.21	1.0	11.2	8.6	14.3	0.304
SPA-8	J1TW68	7/29/14	0.42	2.3	71.4	0.19	0.46	10.1	8.5	14.6	0.304
SPA-9	J1TW69	7/29/14	0.17	2.1	60.9	0.17	0.43	8.5	8.4	15.8	0.283
SPA-10	J1TW70	7/29/14	0.19	1.9	69.4	0.16	1.3	9.4	7.9	20.5	0.0775
SPA-11	J1TW71	7/29/14	0.51	2.4	83.1	0.26	1.2	11.0	9.3	15.3	0.367
SPA-12	J1TW72	7/29/14	0.18	2.6	84.6	0.25	1.8	10.9	8.7	14.0	0.450

Statistical Computations

	Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Hexavalent Chromium
95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	25%	0%	0%	0%	33%	0%	0%	0%	17%
Mean	0.38	2.4	72.8	0.21	1.0	9.7	8.4	15.0	0.277
Standard deviation	0.13	0.40	8.2	0.039	0.56	1.3	0.36	1.9	0.106
95% UCL on mean	0.45	2.6	77.3	0.23	1.5	10.5	8.6	15.9	0.327
Maximum value	0.55	3.1	84.6	0.28	2.2	11.4	9.3	20.5	0.450
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	5 GW & River Protection	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NA	NO	NA	NA	NA	NO
> 10% above Cleanup Limit?	NA	NA	NA	NA	NO	NA	NA	NA	NO
Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NO	NA	NA	NA	NO
WAC 173-340 Compliance?	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Acronyms and qualifiers are defined on sheet 3.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 04/07/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 04/07/14
Sheet No. 10 of 19

1607-D2:5 Subsite Statistical Calculations

Verification Data - Decision Unit - SPA

Sample Area	Sample Number	Sample Date	Lead			Manganese			Mercury			Nickel			Vanadium			Zinc			Chloride			Fluoride			Nitrogen in Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1TW61	7/29/14	4.6		0.24	350	X	0.090	0.0088	B	0.0057	10.8	X	0.11	51.0		0.084	41.9	X	0.36	7.2	N	2.0	0.82	U	0.82	2.8		0.32
Duplicate of J1TW61	J1TW73	7/29/14	4.5		0.23	312	X	0.087	0.0092	B	0.0051	11.9	X	0.11	49.6		0.081	40.7	X	0.34	56.5	M	2.0	2.9	B	0.81	3.0		0.31
SPA-2	J1TW62	7/29/14	5.1		0.25	341	X	0.092	0.022		0.0055	12.0	X	0.11	46.8		0.086	42.3	X	0.36	92.1		2.0	4.4	B	0.83	9.0		0.32
SPA-3	J1TW63	7/29/14	4.1		0.24	295	X	0.087	0.0094	B	0.0063	9.4	X	0.11	53.3		0.082	40.3	X	0.35	84.0		2.0	4.2	B	0.84	5.5		0.32
SPA-4	J1TW64	7/29/14	4.4		0.25	301	X	0.092	0.0088	B	0.0051	11.3	X	0.11	50.2		0.086	40.3	X	0.37	76.4		2.0	4.4	B	0.81	4.0		0.31
SPA-5	J1TW65	7/29/14	3.9		0.25	296	X	0.094	0.0082	B	0.0054	11.0	X	0.12	56.2		0.088	41.1	X	0.37	85.4		2.0	4.0	B	0.82	2.0	B	0.32
SPA-6	J1TW66	7/29/14	4.1		0.24	310	X	0.088	0.0082	B	0.0049	10.2	X	0.11	57.3		0.082	41.6	X	0.35	73.3		2.0	4.1	B	0.82	2.2	B	0.31
SPA-7	J1TW67	7/29/14	4.8		0.25	318	X	0.093	0.0095	B	0.0056	12.6	X	0.11	55.5		0.087	42.1	X	0.37	74.3		2.0	3.7	B	0.82	2.1	B	0.31
SPA-8	J1TW68	7/29/14	4.8		0.25	321	X	0.094	0.0090	B	0.0048	11.6	X	0.12	55.8		0.088	42.9	X	0.37	70.5		2.0	3.6	B	0.82	2.4	B	0.31
SPA-9	J1TW69	7/29/14	4.1		0.23	305	X	0.086	0.0084	B	0.0051	11.1	X	0.11	55.9		0.081	42.0	X	0.34	78.1		2.0	3.9	B	0.83	3.3		0.32
SPA-10	J1TW70	7/29/14	4.3		0.27	296	X	0.098	0.0095	B	0.0054	10.5	X	0.12	49.1		0.092	40.7	X	0.39	78.7		2.0	3.4	B	0.83	4.9		0.32
SPA-11	J1TW71	7/29/14	5.3		0.26	382	X	0.096	0.0079	B	0.0054	11.8	X	0.12	54.8		0.091	44.5	X	0.38	77.1		2.0	3.3	B	0.81	3.1		0.31
SPA-12	J1TW72	7/29/14	5.4		0.25	357	X	0.093	0.0087	B	0.0054	11.5	X	0.11	53.2		0.087	43.3	X	0.37	69.6		2.0	3.6	B	0.81	6.7		0.31

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Lead mg/kg	Manganese mg/kg	Mercury mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg	Chloride mg/kg	Fluoride mg/kg	Nitrogen in Nitrate mg/kg
SPA-1	J1TW61/ J1TW73	7/29/14	4.6	331	0.0090	11.4	50.3	41.3	31.9	1.7	2.9
SPA-2	J1TW62	7/29/14	5.1	341	0.022	12.0	46.8	42.3	92.1	4.4	9.0
SPA-3	J1TW63	7/29/14	4.1	295	0.0094	9.4	53.3	40.3	84.0	4.2	5.5
SPA-4	J1TW64	7/29/14	4.4	301	0.0088	11.3	50.2	40.3	76.4	4.4	4.0
SPA-5	J1TW65	7/29/14	3.9	296	0.0082	11.0	56.2	41.1	85.4	4.0	2.0
SPA-6	J1TW66	7/29/14	4.1	310	0.0082	10.2	57.3	41.6	73.3	4.1	2.2
SPA-7	J1TW67	7/29/14	4.8	318	0.0095	12.6	55.5	42.1	74.3	3.7	2.1
SPA-8	J1TW68	7/29/14	4.8	321	0.0090	11.6	55.8	42.9	70.5	3.6	2.4
SPA-9	J1TW69	7/29/14	4.1	305	0.0084	11.1	55.9	42.0	78.1	3.9	3.3
SPA-10	J1TW70	7/29/14	4.3	296	0.0095	10.5	49.1	40.7	78.7	3.4	4.9
SPA-11	J1TW71	7/29/14	5.3	382	0.0079	11.8	54.8	44.5	77.1	3.3	3.1
SPA-12	J1TW72	7/29/14	5.4	357	0.0087	11.5	53.2	43.3	69.6	3.6	6.7

Statistical Computations

	Lead	Manganese	Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate
95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mean	4.6	321	0.0099	11.2	53.2	41.9	74.3	3.7	4.0
Standard deviation	0.51	27.4	0.0039	0.85	3.3	1.3	14.8	0.74	2.2
95% UCL on mean	4.9	336	0.012	11.7	55.0	42.5	81.3	4.0	5.5
Maximum value	5.4	382	0.022	12.6	57.3	44.5	92.1	4.4	9.0
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25,000 GW Protection	96 GW Protection	1,000 GW Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO	NA
> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO	NA
WAC 173-340 Compliance?	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 04/07/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 04/07/14
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1607-D2:5 Subsite Statistical Calculations
Verification Data - Decision Unit - SPA

1	Sample	Sample	Sample	Nitrogen in Nitrite and Nitrate			Sulfate		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL
3	SPA-1	J1TW61	7/29/14	2.5		0.37	7.2	N	1.7
4	Duplicate of J1TW61	J1TW73	7/29/14	2.8		0.37	7.2		1.7
5	SPA-2	J1TW62	7/29/14	8.1		0.37	17.7		1.7
6	SPA-3	J1TW63	7/29/14	5.4		0.37	8.3		1.7
7	SPA-4	J1TW64	7/29/14	4.6		0.36	14.1		1.7
8	SPA-5	J1TW65	7/29/14	1.3		0.37	7.8		1.7
9	SPA-6	J1TW66	7/29/14	1.9		0.36	12.5		1.7
10	SPA-7	J1TW67	7/29/14	1.4		0.36	6.5		1.7
11	SPA-8	J1TW68	7/29/14	1.9		0.36	69.4		1.7
12	SPA-9	J1TW69	7/29/14	2.5		0.36	7.5		1.7
13	SPA-10	J1TW70	7/29/14	5.0		0.37	8.6		1.7
14	SPA-11	J1TW71	7/29/14	2.9		0.37	7.7		1.7
15	SPA-12	J1TW72	7/29/14	8.2		0.37	11.6		1.7

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Nitrogen in Nitrite and Nitrate mg/kg			Sulfate mg/kg		
18	Area	Number	Date						
19	SPA-1	J1TW61/ J1TW73	7/29/14	2.7			7.2		
20	SPA-2	J1TW62	7/29/14	8.1			17.7		
21	SPA-3	J1TW63	7/29/14	5.4			8.3		
22	SPA-4	J1TW64	7/29/14	4.6			14.1		
23	SPA-5	J1TW65	7/29/14	1.3			7.8		
24	SPA-6	J1TW66	7/29/14	1.9			12.5		
25	SPA-7	J1TW67	7/29/14	1.4			6.5		
26	SPA-8	J1TW68	7/29/14	1.9			69.4		
27	SPA-9	J1TW69	7/29/14	2.5			7.5		
28	SPA-10	J1TW70	7/29/14	5.0			8.6		
29	SPA-11	J1TW71	7/29/14	2.9			7.7		
30	SPA-12	J1TW72	7/29/14	8.2			11.6		

31 **Statistical Computations**

32		Nitrogen in Nitrite and Nitrate	Sulfate
33	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
34	N	12	12
35	% < Detection limit	0%	0%
36	Mean	3.8	14.9
37	Standard deviation	2.4	17.5
38	95% UCL on mean	6.1	23.2
39	Maximum value	8.2	69.4
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	1,000 GW Protection	25000 GW Protection
41	**WAC 173-340 3-PART TEST**		
42	95% UCL > Cleanup Limit?	NA	NA
43	> 10% above Cleanup Limit?	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

46 **Acronyms and qualifiers are defined on sheet 3.**

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 09/11/14
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1 **1607-D2:5 Subsite Maximum Calculations**

2 **Verification Data - Decision Unit - SPA**

3	Sample	Sample	Sample	Molybdenum			Selenium		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SPA-1	J1TW61	7/29/14	0.45	B	0.23	0.77	U	0.77
6	Duplicate of J1TW61	J1TW73	7/29/14	0.23	U	0.23	0.74	U	0.74
7	SPA-2	J1TW62	7/29/14	0.37	B	0.24	0.89	B	0.79
8	SPA-3	J1TW63	7/29/14	0.23	U	0.23	0.75	U	0.75
9	SPA-4	J1TW64	7/29/14	0.24	U	0.24	0.79	U	0.79
10	SPA-5	J1TW65	7/29/14	0.24	U	0.24	0.81	U	0.81
11	SPA-6	J1TW66	7/29/14	0.25	B	0.23	0.75	U	0.75
12	SPA-7	J1TW67	7/29/14	0.24	U	0.24	0.80	U	0.80
13	SPA-8	J1TW68	7/29/14	0.24	U	0.24	0.81	U	0.81
14	SPA-9	J1TW69	7/29/14	0.22	U	0.22	0.74	U	0.74
15	SPA-10	J1TW70	7/29/14	0.26	U	0.26	0.84	U	0.84
16	SPA-11	J1TW71	7/29/14	0.25	U	0.25	0.83	U	0.83
17	SPA-12	J1TW72	7/29/14	0.24	U	0.24	0.80	U	0.80

18 **Statistical Computations**

19		Molybdenum	Selenium
20	% < Detection limit	77%	92%
21	Maximum value	0.45	0.89
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	8 GW Protection	1 River Protection
23	**3-PART TEST**		
24	Maximum > Cleanup Limit?	NO	NO
25	> 10% above Cleanup Limit?	NO	NO
26	Any sample > 2X Cleanup Limit?	NO	NO
27	**3-Part Test Compliance?**	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

28 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 09/11/14
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Ecology Software (MTCAStat) Results, 1607-D2:5 Subsite - Decision Unit EXC

Arsenic 95% UCL Calculation

DATA	ID
2.9	J1TW48/ J1TW60
2.5	J1TW49
1.1	J1TW50
1.6	J1TW51
2.5	J1TW52
2.5	J1TW53
1.6	J1TW54
2.7	J1TW55
1.7	J1TW56
3.3	J1TW57
2.6	J1TW58
2.8	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	2.3
Censored		Lognormal mean	2.3
Detection limit or PQL		Std. devn.	0.66
Method detection limit		Median	2.5
TOTAL	12	Min.	1.1
		Max.	3.3

Lognormal distribution? r-squared is: 0.868
Normal distribution? r-squared is: 0.917
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 2.7

Barium 95% UCL Calculation

DATA	ID
75.0	J1TW48/ J1TW60
65.6	J1TW49
48.3	J1TW50
50.4	J1TW51
82.4	J1TW52
64.2	J1TW53
54.1	J1TW54
65.2	J1TW55
45.0	J1TW56
81.9	J1TW57
70.5	J1TW58
88.0	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	65.9
Censored		Lognormal mean	66.1
Detection limit or PQL		Std. devn.	14.3
Method detection limit		Median	65.4
TOTAL	12	Min.	45.0
		Max.	88.0

Lognormal distribution? r-squared is: 0.959
Normal distribution? r-squared is: 0.965
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 74.9

Beryllium 95% UCL Calculation

DATA	ID
0.20	J1TW48/ J1TW60
0.19	J1TW49
0.043	J1TW50
0.13	J1TW51
0.18	J1TW52
0.18	J1TW53
0.10	J1TW54
0.20	J1TW55
0.10	J1TW56
0.30	J1TW57
0.23	J1TW58
0.17	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	0.17
Censored		Lognormal mean	0.17
Detection limit or PQL		Std. devn.	0.068
Method detection limit		Median	0.18
TOTAL	12	Min.	0.043
		Max.	0.30

Lognormal distribution? r-squared is: 0.855
Normal distribution? r-squared is: 0.952
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.20

Boron 95% UCL Calculation

DATA	ID
1.9	J1TW48/ J1TW60
1.7	J1TW49
0.47	J1TW50
1.2	J1TW51
3.1	J1TW52
1.0	J1TW53
0.95	J1TW54
1.6	J1TW55
0.44	J1TW56
1.7	J1TW57
1.4	J1TW58
0.47	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	1.3
Censored		Lognormal mean	1.4
Detection limit or PQL		Std. devn.	0.76
Method detection limit		Median	1.3
TOTAL	12	Min.	0.44
		Max.	3.1

Lognormal distribution? r-squared is: 0.922
Normal distribution? r-squared is: 0.899
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.1

Cadmium 95% UCL Calculation

DATA	ID
0.17	J1TW48/ J1TW60
0.15	J1TW49
0.14	J1TW50
0.16	J1TW51
0.16	J1TW52
0.21	J1TW53
0.15	J1TW54
0.22	J1TW55
0.15	J1TW56
0.19	J1TW57
0.17	J1TW58
0.15	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	0.17
Censored		Lognormal mean	0.17
Detection limit or PQL		Std. devn.	0.026
Method detection limit		Median	0.16
TOTAL	12	Min.	0.14
		Max.	0.22

Lognormal distribution? r-squared is: 0.875
Normal distribution? r-squared is: 0.846
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.18

Chromium 95% UCL Calculation

DATA	ID
9.2	J1TW48/ J1TW60
9.2	J1TW49
3.4	J1TW50
4.9	J1TW51
7.8	J1TW52
8.9	J1TW53
5.8	J1TW54
9.9	J1TW55
4.7	J1TW56
14.0	J1TW57
9.7	J1TW58
7.9	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	7.9
Censored		Lognormal mean	8.0
Detection limit or PQL		Std. devn.	2.9
Method detection limit		Median	8.4
TOTAL	12	Min.	3.4
		Max.	14.0

Lognormal distribution? r-squared is: 0.930
Normal distribution? r-squared is: 0.937
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.2

Cobalt 95% UCL Calculation

DATA	ID
8.0	J1TW48/ J1TW60
7.6	J1TW49
9.0	J1TW50
8.2	J1TW51
8.8	J1TW52
8.4	J1TW53
8.3	J1TW54
8.7	J1TW55
7.8	J1TW56
8.7	J1TW57
8.7	J1TW58
8.3	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	8.4
Censored		Lognormal mean	8.4
Detection limit or PQL		Std. devn.	0.43
Method detection limit		Median	8.4
TOTAL	12	Min.	7.6
		Max.	9.0

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.960
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.6

Copper 95% UCL Calculation

DATA	ID
13.8	J1TW48/ J1TW60
14.0	J1TW49
13.4	J1TW50
16.4	J1TW51
16.1	J1TW52
14.6	J1TW53
14.7	J1TW54
17.5	J1TW55
14.2	J1TW56
16.2	J1TW57
16.0	J1TW58
15.5	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	15.2
Censored		Lognormal mean	15.2
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	15.1
TOTAL	12	Min.	13.4
		Max.	17.5

Lognormal distribution? r-squared is: 0.963
Normal distribution? r-squared is: 0.959
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.9

Lead 95% UCL Calculation

DATA	ID
5.2	J1TW48/ J1TW60
4.7	J1TW49
2.8	J1TW50
3.6	J1TW51
4.6	J1TW52
4.2	J1TW53
3.3	J1TW54
5.0	J1TW55
3.0	J1TW56
5.6	J1TW57
4.8	J1TW58
4.4	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	4.3
Censored		Lognormal mean	4.3
Detection limit or PQL		Std. devn.	0.90
Method detection limit		Median	4.5
TOTAL	12	Min.	2.8
		Max.	5.6

Lognormal distribution? r-squared is: 0.933
Normal distribution? r-squared is: 0.959
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.9

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
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Calc. No. 0100D-CA-V0549
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Ecology Software (MTCAStat) Results, 1607-D2:5 Subsite - Decision Unit EXC

Manganese 95% UCL Calculation

DATA	ID
	J1TW48/
333	J1TW60
290	J1TW49
294	J1TW50
262	J1TW51
345	J1TW52
309	J1TW53
278	J1TW54
322	J1TW55
282	J1TW56
359	J1TW57
353	J1TW58
385	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	318
Censored		Lognormal mean	318
Detection limit or PQL		Std. devn.	37.9
Method detection limit		Median	316
TOTAL	12	Min.	262
		Max.	385

Lognormal distribution? r-squared is: 0.980
Normal distribution? r-squared is: 0.976
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 339

Mercury 95% UCL Calculation

DATA	ID
	J1TW48/
0.0061	J1TW60
0.012	J1TW49
0.0028	J1TW50
0.0055	J1TW51
0.0081	J1TW52
0.0027	J1TW53
0.0026	J1TW54
0.077	J1TW55
0.0028	J1TW56
0.0067	J1TW57
0.0074	J1TW58
0.0056	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	0.012
Censored		Lognormal mean	0.010
Detection limit or PQL		Std. devn.	0.021
Method detection limit		Median	0.0059
TOTAL	12	Min.	0.0026
		Max.	0.077

Lognormal distribution? r-squared is: 0.788
Normal distribution? r-squared is: 0.413
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.021

Nickel 95% UCL Calculation

DATA	ID
	J1TW48/
10.5	J1TW60
10.0	J1TW49
7.2	J1TW50
8.7	J1TW51
10.4	J1TW52
9.2	J1TW53
8.7	J1TW54
11.2	J1TW55
6.9	J1TW56
13.7	J1TW57
11.1	J1TW58
9.7	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	9.8
Censored		Lognormal mean	9.8
Detection limit or PQL		Std. devn.	1.9
Method detection limit		Median	9.9
TOTAL	12	Min.	6.9
		Max.	13.7

Lognormal distribution? r-squared is: 0.960
Normal distribution? r-squared is: 0.954
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.9

Vanadium 95% UCL Calculation

DATA	ID
	J1TW48/
48.8	J1TW60
46.1	J1TW49
59.8	J1TW50
49.7	J1TW51
55.4	J1TW52
57.0	J1TW53
56.0	J1TW54
54.8	J1TW55
54.5	J1TW56
48.7	J1TW57
50.7	J1TW58
46.7	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	52.4
Censored		Lognormal mean	52.4
Detection limit or PQL		Std. devn.	4.4
Method detection limit		Median	52.6
TOTAL	12	Min.	46.1
		Max.	59.8

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.952
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 54.8

Zinc 95% UCL Calculation

DATA	ID
	J1TW48/
43.1	J1TW60
42.6	J1TW49
41.5	J1TW50
40.5	J1TW51
45.6	J1TW52
44.5	J1TW53
40.9	J1TW54
48.5	J1TW55
38.6	J1TW56
45.5	J1TW57
44.7	J1TW58
38.8	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	42.9
Censored		Lognormal mean	42.9
Detection limit or PQL		Std. devn.	3.0
Method detection limit		Median	42.8
TOTAL	12	Min.	38.6
		Max.	48.5

Lognormal distribution? r-squared is: 0.975
Normal distribution? r-squared is: 0.973
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 44.5

Chloride 95% UCL Calculation

DATA	ID
	J1TW48/
10.6	J1TW60
6.4	J1TW49
5.5	J1TW50
6.5	J1TW51
11.0	J1TW52
7.0	J1TW53
5.8	J1TW54
6.5	J1TW55
6.0	J1TW56
5.6	J1TW57
7.5	J1TW58
6.8	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	7.1
Censored		Lognormal mean	7.1
Detection limit or PQL		Std. devn.	1.8
Method detection limit		Median	6.5
TOTAL	12	Min.	5.5
		Max.	11.0

Lognormal distribution? r-squared is: 0.828
Normal distribution? r-squared is: 0.761
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 8.0

Fluoride 95% UCL Calculation

DATA	ID
	J1TW48/
1.4	J1TW60
1.4	J1TW49
0.92	J1TW50
1.3	J1TW51
1.8	J1TW52
1.7	J1TW53
1.4	J1TW54
1.7	J1TW55
1.1	J1TW56
1.7	J1TW57
1.9	J1TW58
1.4	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	1.5
Censored		Lognormal mean	1.5
Detection limit or PQL		Std. devn.	0.29
Method detection limit		Median	1.4
TOTAL	12	Min.	0.92
		Max.	1.9

Lognormal distribution? r-squared is: 0.911
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.7

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
	J1TW48/
9.4	J1TW60
2.3	J1TW49
1.2	J1TW50
4.9	J1TW51
9.7	J1TW52
2.3	J1TW53
1.5	J1TW54
2.5	J1TW55
1.8	J1TW56
1.1	J1TW57
2.5	J1TW58
0.93	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	3.3
Censored		Lognormal mean	3.3
Detection limit or PQL		Std. devn.	3.1
Method detection limit		Median	2.3
TOTAL	12	Min.	0.93
		Max.	9.7

Lognormal distribution? r-squared is: 0.911
Normal distribution? r-squared is: 0.722
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 6.0

Nitrogen in nitrate and nitrite 95% UCL Calculation

DATA	ID
	J1TW48/
9.4	J1TW60
2.1	J1TW49
0.18	J1TW50
3.1	J1TW51
8.3	J1TW52
1.4	J1TW53
0.48	J1TW54
2.5	J1TW55
0.61	J1TW56
0.49	J1TW57
1.2	J1TW58
0.18	J1TW59

Number of samples		Uncensored values	
Uncensored	12	Mean	2.5
Censored		Lognormal mean	2.9
Detection limit or PQL		Std. devn.	3.1
Method detection limit		Median	1.3
TOTAL	12	Min.	0.18
		Max.	9.4

Lognormal distribution? r-squared is: 0.967
Normal distribution? r-squared is: 0.729
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.6

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 1607-D2:5 Subsite - Decision Unit EXC

	DATA	ID	Sulfate 95% UCL Calculation			
1		J1TW48/				
2	10.4	J1TW60				
3	5.2	J1TW49				
4	3.6	J1TW50	Number of samples		Uncensored values	
5	5.9	J1TW51	Uncensored	12	Mean	8.3
6	9.1	J1TW52	Censored		Lognormal mean	8.1
7	7.7	J1TW53	Detection limit or PQL		Std. devn.	7.0
8	4.3	J1TW54	Method detection limit		Median	6.4
9	6.7	J1TW55	TOTAL	12	Min.	3.6
10	6.0	J1TW56			Max.	29.5
11	4.2	J1TW57				
12	6.8	J1TW58				
13	29.5	J1TW59				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.843		r-squared is: 0.567	
16			Recommendations:			
17			Reject BOTH lognormal and normal distributions.			
18						
19			UCL (based on Z-statistic) is		11.6	
20						

21 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
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Ecology Software (MTCAStat) Results, 1607-D2:5 Subsite - Decision Unit SPA

Antimony 95% UCL Calculation

DATA	ID
	J1TW61/
0.36	J1TW73
0.47	J1TW62
0.50	J1TW63
0.37	J1TW64
0.41	J1TW65
0.42	J1TW66
0.53	J1TW67
0.42	J1TW68
0.17	J1TW69
0.19	J1TW70
0.51	J1TW71
0.18	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	0.38
Censored		Lognormal mean	0.38
Detection limit or PQL		Std. devn.	0.13
Method detection limit		Median	0.42
TOTAL	12	Min.	0.17
		Max.	0.53

Lognormal distribution? r-squared is: 0.811
Normal distribution? r-squared is: 0.883
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.45

Arsenic 95% UCL Calculation

DATA	ID
	J1TW61/
2.8	J1TW73
3.1	J1TW62
2.1	J1TW63
2.4	J1TW64
1.6	J1TW65
2.6	J1TW66
2.4	J1TW67
2.3	J1TW68
2.1	J1TW69
1.9	J1TW70
2.4	J1TW71
2.6	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	2.4
Censored		Lognormal mean	2.4
Detection limit or PQL		Std. devn.	0.40
Method detection limit		Median	2.4
TOTAL	12	Min.	1.6
		Max.	3.1

Lognormal distribution? r-squared is: 0.954
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.6

Barium 95% UCL Calculation

DATA	ID
	J1TW61/
79.2	J1TW73
84.0	J1TW62
72.2	J1TW63
67.1	J1TW64
63.1	J1TW65
65.9	J1TW66
72.2	J1TW67
71.4	J1TW68
60.9	J1TW69
69.4	J1TW70
83.1	J1TW71
84.6	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	72.8
Censored		Lognormal mean	72.8
Detection limit or PQL		Std. devn.	8.2
Method detection limit		Median	71.8
TOTAL	12	Min.	60.9
		Max.	84.6

Lognormal distribution? r-squared is: 0.952
Normal distribution? r-squared is: 0.943
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 77.3

Beryllium 95% UCL Calculation

DATA	ID
	J1TW61/
0.22	J1TW73
0.28	J1TW62
0.20	J1TW63
0.20	J1TW64
0.16	J1TW65
0.18	J1TW66
0.21	J1TW67
0.19	J1TW68
0.17	J1TW69
0.16	J1TW70
0.26	J1TW71
0.25	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	0.21
Censored		Lognormal mean	0.21
Detection limit or PQL		Std. devn.	0.039
Method detection limit		Median	0.20
TOTAL	12	Min.	0.16
		Max.	0.28

Lognormal distribution? r-squared is: 0.958
Normal distribution? r-squared is: 0.936
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.23

Boron 95% UCL Calculation

DATA	ID
	J1TW61/
0.91	J1TW73
2.2	J1TW62
0.99	J1TW63
1.1	J1TW64
0.46	J1TW65
0.43	J1TW66
1.0	J1TW67
0.46	J1TW68
0.43	J1TW69
1.3	J1TW70
1.2	J1TW71
1.8	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	1.0
Censored		Lognormal mean	1.0
Detection limit or PQL		Std. devn.	0.56
Method detection limit		Median	1.0
TOTAL	12	Min.	0.43
		Max.	2.2

Lognormal distribution? r-squared is: 0.916
Normal distribution? r-squared is: 0.902
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.5

Chromium 95% UCL Calculation

DATA	ID
	J1TW61/
9.7	J1TW73
11.4	J1TW62
7.7	J1TW63
9.5	J1TW64
7.9	J1TW65
9.4	J1TW66
11.2	J1TW67
10.1	J1TW68
8.5	J1TW69
9.4	J1TW70
11.0	J1TW71
10.9	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	9.7
Censored		Lognormal mean	9.7
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	9.6
TOTAL	12	Min.	7.7
		Max.	11.4

Lognormal distribution? r-squared is: 0.941
Normal distribution? r-squared is: 0.950
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.5

Cobalt 95% UCL Calculation

DATA	ID
	J1TW61/
8.4	J1TW73
8.0	J1TW62
8.4	J1TW63
8.1	J1TW64
8.5	J1TW65
8.5	J1TW66
8.6	J1TW67
8.5	J1TW68
8.4	J1TW69
7.9	J1TW70
9.3	J1TW71
8.7	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	8.4
Censored		Lognormal mean	8.4
Detection limit or PQL		Std. devn.	0.36
Method detection limit		Median	8.5
TOTAL	12	Min.	7.9
		Max.	9.3

Lognormal distribution? r-squared is: 0.896
Normal distribution? r-squared is: 0.886
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 8.6

Copper 95% UCL Calculation

DATA	ID
	J1TW61/
14.4	J1TW73
13.9	J1TW62
15.6	J1TW63
13.2	J1TW64
14.2	J1TW65
13.8	J1TW66
14.3	J1TW67
14.6	J1TW68
15.8	J1TW69
20.5	J1TW70
15.3	J1TW71
14.0	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	15.0
Censored		Lognormal mean	15.0
Detection limit or PQL		Std. devn.	1.9
Method detection limit		Median	14.3
TOTAL	12	Min.	13.2
		Max.	20.5

Lognormal distribution? r-squared is: 0.734
Normal distribution? r-squared is: 0.677
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 15.9

Hexavalent Chromium 95% UCL Calculation

DATA	ID
	J1TW61/
0.317	J1TW73
0.0775	J1TW62
0.245	J1TW63
0.283	J1TW64
0.288	J1TW65
0.324	J1TW66
0.304	J1TW67
0.304	J1TW68
0.283	J1TW69
0.0775	J1TW70
0.367	J1TW71
0.450	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	0.277
Censored		Lognormal mean	0.290
Detection limit or PQL		Std. devn.	0.106
Method detection limit		Median	0.296
TOTAL	12	Min.	0.0775
		Max.	0.450

Lognormal distribution? r-squared is: 0.703
Normal distribution? r-squared is: 0.850
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.327

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
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Lead 95% UCL Calculation

DATA	ID
4.6	J1TW61/ J1TW73
5.1	J1TW62
4.1	J1TW63
4.4	J1TW64
3.9	J1TW65
4.1	J1TW66
4.8	J1TW67
4.8	J1TW68
4.1	J1TW69
4.3	J1TW70
5.3	J1TW71
5.4	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	4.6
Censored		Lognormal mean	4.6
Detection limit or PQL		Std. devn.	0.51
Method detection limit		Median	4.5
TOTAL	12	Min.	3.9
		Max.	5.4

Lognormal distribution? r-squared is: 0.951
Normal distribution? r-squared is: 0.944
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.9

Manganese 95% UCL Calculation

DATA	ID
331	J1TW61/ J1TW73
341	J1TW62
295	J1TW63
301	J1TW64
296	J1TW65
310	J1TW66
318	J1TW67
321	J1TW68
305	J1TW69
296	J1TW70
382	J1TW71
357	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	321
Censored		Lognormal mean	321
Detection limit or PQL		Std. devn.	27.4
Method detection limit		Median	314
TOTAL	12	Min.	295
		Max.	382

Lognormal distribution? r-squared is: 0.900
Normal distribution? r-squared is: 0.882
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 336

Mercury 95% UCL Calculation

DATA	ID
0.0090	J1TW61/ J1TW73
0.022	J1TW62
0.0094	J1TW63
0.0088	J1TW64
0.0082	J1TW65
0.0082	J1TW66
0.0095	J1TW67
0.0090	J1TW68
0.0084	J1TW69
0.0095	J1TW70
0.0079	J1TW71
0.0087	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	0.0099
Censored		Lognormal mean	0.0098
Detection limit or PQL		Std. devn.	0.0039
Method detection limit		Median	0.0089
TOTAL	12	Min.	0.0079
		Max.	0.022

Lognormal distribution? r-squared is: 0.510
Normal distribution? r-squared is: 0.425
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.012

Nickel 95% UCL Calculation

DATA	ID
11.4	J1TW61/ J1TW73
12.0	J1TW62
9.4	J1TW63
11.3	J1TW64
11.0	J1TW65
10.2	J1TW66
12.6	J1TW67
11.6	J1TW68
11.1	J1TW69
10.5	J1TW70
11.8	J1TW71
11.5	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	11.2
Censored		Lognormal mean	11.2
Detection limit or PQL		Std. devn.	0.85
Method detection limit		Median	11.3
TOTAL	12	Min.	9.4
		Max.	12.6

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.960
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.7

Vanadium 95% UCL Calculation

DATA	ID
50.3	J1TW61/ J1TW73
46.8	J1TW62
53.3	J1TW63
50.2	J1TW64
56.2	J1TW65
57.3	J1TW66
55.5	J1TW67
55.8	J1TW68
55.9	J1TW69
49.1	J1TW70
54.8	J1TW71
53.2	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	53.2
Censored		Lognormal mean	53.2
Detection limit or PQL		Std. devn.	3.3
Method detection limit		Median	54.1
TOTAL	12	Min.	46.8
		Max.	57.3

Lognormal distribution? r-squared is: 0.912
Normal distribution? r-squared is: 0.920
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 55.0

Zinc 95% UCL Calculation

DATA	ID
41.3	J1TW61/ J1TW73
42.3	J1TW62
40.3	J1TW63
40.3	J1TW64
41.1	J1TW65
41.6	J1TW66
42.1	J1TW67
42.9	J1TW68
42.0	J1TW69
40.7	J1TW70
44.5	J1TW71
43.3	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	41.9
Censored		Lognormal mean	41.9
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	41.8
TOTAL	12	Min.	40.3
		Max.	44.5

Lognormal distribution? r-squared is: 0.962
Normal distribution? r-squared is: 0.957
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 42.5

Chloride 95% UCL Calculation

DATA	ID
31.9	J1TW61/ J1TW73
92.1	J1TW62
84.0	J1TW63
76.4	J1TW64
85.4	J1TW65
73.3	J1TW66
74.3	J1TW67
70.5	J1TW68
78.1	J1TW69
78.7	J1TW70
77.1	J1TW71
69.6	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	74.3
Censored		Lognormal mean	75.0
Detection limit or PQL		Std. devn.	14.8
Method detection limit		Median	76.8
TOTAL	12	Min.	31.9
		Max.	92.1

Lognormal distribution? r-squared is: 0.586
Normal distribution? r-squared is: 0.718
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 81.3

Fluoride 95% UCL Calculation

DATA	ID
1.7	J1TW61/ J1TW73
4.4	J1TW62
4.2	J1TW63
4.4	J1TW64
4.0	J1TW65
4.1	J1TW66
3.7	J1TW67
3.6	J1TW68
3.9	J1TW69
3.4	J1TW70
3.3	J1TW71
3.6	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	3.7
Censored		Lognormal mean	3.7
Detection limit or PQL		Std. devn.	0.74
Method detection limit		Median	3.8
TOTAL	12	Min.	1.7
		Max.	4.4

Lognormal distribution? r-squared is: 0.647
Normal distribution? r-squared is: 0.775
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.0

Nitrogen in nitrate 95% UCL Calculation

DATA	ID
2.9	J1TW61/ J1TW73
9.0	J1TW62
5.5	J1TW63
4.0	J1TW64
2.0	J1TW65
2.2	J1TW66
2.1	J1TW67
2.4	J1TW68
3.3	J1TW69
4.9	J1TW70
3.1	J1TW71
6.7	J1TW72

Number of samples		Uncensored values	
Uncensored	12	Mean	4.0
Censored		Lognormal mean	4.0
Detection limit or PQL		Std. devn.	2.2
Method detection limit		Median	3.2
TOTAL	12	Min.	2.0
		Max.	9.0

Lognormal distribution? r-squared is: 0.950
Normal distribution? r-squared is: 0.862
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.5

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

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Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 09/11/14
Sheet No. 18 of 19

Ecology Software (MTCAStat) Results, 1607-D2:5 Subsite - Decision Unit SPA

1	DATA	ID	Nitrogen in nitrate and nitrite 95% UCL Calculation			
		J1TW61/				
2	2.7	J1TW73				
3	8.1	J1TW62				
4	5.4	J1TW63	Number of samples		Uncensored values	
5	4.6	J1TW64	Uncensored	12	Mean	3.8
6	1.3	J1TW65	Censored		Lognormal mean	3.9
7	1.9	J1TW66	Detection limit or PQL		Std. devn.	2.4
8	1.4	J1TW67	Method detection limit		Median	2.8
9	1.9	J1TW68	TOTAL	12	Min.	1.3
10	2.5	J1TW69			Max.	8.2
11	5.0	J1TW70				
12	2.9	J1TW71				
13	8.2	J1TW72				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.955		r-squared is: 0.880	
16			Recommendations:			
17			Use lognormal distribution.			
18						
19			UCL (Land's method) is		6.1	
20						

DATA	ID	Sulfate 95% UCL Calculation			
	J1TW61/				
7.2	J1TW73				
17.7	J1TW62				
8.3	J1TW63	Number of samples		Uncensored values	
14.1	J1TW64	Uncensored	12	Mean	14.9
7.8	J1TW65	Censored		Lognormal mean	13.8
12.5	J1TW66	Detection limit or PQL		Std. devn.	17.5
6.5	J1TW67	Method detection limit		Median	8.5
69.4	J1TW68	TOTAL	12	Min.	6.5
7.5	J1TW69			Max.	69.4
8.6	J1TW70				
7.7	J1TW71				
11.6	J1TW72				
		Lognormal distribution?		Normal distribution?	
		r-squared is: 0.717		r-squared is: 0.459	
		Recommendations:			
		Reject BOTH lognormal and normal distributions.			
		UCL (based on Z-statistic) is		23.2	

21 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations

Date 09/11/14
Job No. 14655

Calc. No. 0100D-CA-V0549
Checked I. B. Berezovskiy

Rev. No. 0
Date 09/11/14
Sheet No. 19 of 19

Duplicate Analysis - 1607-D2:5 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	7510	X	1.4	3.0		0.58	72.0	X	0.067	0.20		0.029	2.0		0.86	0.18		0.036	4730	X	12.4	9.0	X	0.051	8.0	X	0.088	13.6		0.19
Duplicate of J1TW48	J1TW60	6/26/14	8200	X	1.5	2.8		0.65	78.0	X	0.075	0.20		0.033	1.7	B	0.97	0.15	B	0.041	4820	X	14.0	9.3	X	0.057	7.9	X	0.099	14.0		0.22

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper
TDL		5	10	2	0.2	2	0.2	100	1	2	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	8.8%		8.0%				1.9%	3.3%		2.9%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 1607-D2:5 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	21200	X	3.3	5.1		0.24	4560	X	3.3	321	X	0.088	0.0063	B	0.0053	10.2	X	0.11	1630		36.1	438	NJX	5.0	230		52.0	49.8		0.083
Duplicate of J1TW48	J1TW60	6/26/14	21400	X	3.8	5.3		0.27	4500	X	3.7	344	X	0.099	0.0059	B	0.0053	10.8	X	0.12	1700		40.6	450	NJX	5.6	249		58.5	47.8		0.093

Analysis:

		Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Silicon	Sodium	Vanadium
TDL		5	5	75	5	0.2	4	400	2	50	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	0.9%		1.3%	6.9%				2.7%		4.1%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 1607-D2:5 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Zinc mg/kg	Q	PQL	Chloride mg/kg	Q	PQL	Fluoride mg/kg	Q	PQL	Nitrogen in Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	43.2	X	0.35	10.3	N	1.9	1.2	JBN	0.79	9.2	JN	0.30	10.3		0.36	10.1	JN	1.6
Duplicate of J1TW48	J1TW60	6/26/14	42.9	X	0.39	10.8	N	1.9	1.6	JBN	0.80	9.6	JN	0.31	8.5		0.36	10.7	JN	1.7

Analysis:

		Zinc	Chloride	Fluoride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
TDL		1	2	5	0.75	0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	0.7%	4.7%		4.3%	19.1%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 1607-D2:5 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL	Iron mg/kg	Q	PQL
SPA-1	J1TW61	7/29/14	7690		1.4	2.8		0.59	82.8		0.068	0.21		0.03	3990	X	12.6	9.4	X	0.052	8.4	X	0.090	14.4		0.19	0.266		0.155	22100	X	3.4
Duplicate of J1TW61	J1TW73	7/29/14	7820		1.3	2.7		0.57	75.5		0.066	0.22		0.029	4150	X	12.2	10.0	X	0.050	8.4	X	0.087	14.3		0.19	0.367		0.155	21200	X	3.3

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Calcium	Chromium	Cobalt	Copper	Hexavalent Chromium	Iron
TDL		5	10	2	0.2	100	1	2	1	0.5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	1.7%		9.2%		3.9%	6.2%		0.7%		4.2%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 1607-D2:5 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Lead mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL
SPA-1	J1TW61	7/29/14	4.6		0.24	4830	X	3.3	350	X	0.090	0.0088	B	0.0057	10.8	X	0.11	1360		36.8	328	NX	5.1	219		52.9	51.0		0.084	41.9	X	0.36
Duplicate of J1TW61	J1TW73	7/29/14	4.5		0.23	4750	X	3.2	312	X	0.087	0.0092	B	0.0051	11.9	X	0.11	1420		35.5	299	X	4.9	241		51.1	49.6		0.081	40.7	X	0.34

Analysis:

		Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Silicon	Sodium	Vanadium	Zinc
TDL		5	75	5	0.2	4	400	2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD		1.7%	11.5%				9.3%		2.8%	2.9%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 1607-D2:5 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Chloride mg/kg	Q	PQL	Nitrogen in Nitrate mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
SPA-1	J1TW61	7/29/14	7.2	N	2.0	2.8		0.32	2.5		0.37	7.2	N	1.7
Duplicate of J1TW61	J1TW73	7/29/14	56.5	M	2.0	3.0		0.31	2.8		0.37	7.2		1.7

Analysis:

		Chloride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
TDL		2	0.75	0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	Yes - assess further	No - acceptable	No - acceptable	No - acceptable

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	7510	X	1.4	0.33	UJ	0.33	3.0		0.58	72.0	X	0.067	0.20		0.029
Duplicate of J1TW48	J1TW60	6/26/14	8200	X	1.5	0.38	UJ	0.38	2.8		0.65	78.0	X	0.075	0.20		0.033
EXC-2	J1TW49	6/26/14	7120	X	1.5	0.37	UJ	0.37	2.5		0.65	65.6	X	0.075	0.19	B	0.032
EXC-3	J1TW50	6/26/14	3780	X	1.5	0.36	UJ	0.36	1.1		0.63	48.3	X	0.072	0.043	B	0.031
EXC-4	J1TW51	6/26/14	5430	X	1.6	0.38	UJ	0.38	1.6		0.66	50.4	X	0.076	0.13	B	0.033
EXC-5	J1TW52	6/26/14	6970	X	1.5	0.38	UJ	0.38	2.5		0.66	82.4	X	0.075	0.18	B	0.033
EXC-6	J1TW53	6/26/14	6590	X	1.5	0.37	UJ	0.37	2.5		0.65	64.2	X	0.075	0.18	B	0.032
EXC-7	J1TW54	6/26/14	5100	X	1.3	0.38	JB	0.32	1.6		0.56	54.1	X	0.065	0.098	B	0.028
EXC-8	J1TW55	6/26/14	7670	X	1.6	0.38	UJ	0.38	2.7		0.66	65.2	X	0.076	0.20		0.033
EXC-9	J1TW56	6/26/14	4620	X	1.4	0.34	UJ	0.34	1.7		0.58	45.0	X	0.067	0.10	B	0.029
EXC-10	J1TW57	6/26/14	9540	X	1.5	0.37	UJ	0.37	3.3		0.65	81.9	X	0.075	0.30		0.032
EXC-11	J1TW58	6/26/14	8330	X	1.5	0.38	UJ	0.38	2.6		0.66	70.5	X	0.075	0.23		0.033
EXC-12	J1TW59	6/26/14	6080	X	1.5	0.37	UJ	0.37	2.8		0.63	88.0	X	0.073	0.17	B	0.032
SPA-1	J1TW61	7/29/14	7690		1.4	0.55		0.34	2.8		0.59	82.8		0.068	0.21		0.030
Duplicate of J1TW61	J1TW73	7/29/14	7820		1.3	0.33	U	0.33	2.7		0.57	75.5		0.066	0.22		0.029
SPA-2	J1TW62	7/29/14	9490		1.4	0.47	B	0.35	3.1		0.60	84.0		0.070	0.28		0.030
SPA-3	J1TW63	7/29/14	6930		1.4	0.50	B	0.33	2.1		0.58	72.2		0.066	0.20		0.029
SPA-4	J1TW64	7/29/14	7280		1.4	0.37	B	0.35	2.4		0.61	67.1		0.070	0.20		0.030
SPA-5	J1TW65	7/29/14	6120		1.5	0.41	B	0.36	1.6		0.62	63.1		0.071	0.16	B	0.031
SPA-6	J1TW66	7/29/14	6750		1.4	0.42	B	0.33	2.6		0.58	65.9		0.067	0.18		0.029
SPA-7	J1TW67	7/29/14	7660		1.4	0.53	B	0.35	2.4		0.61	72.2		0.071	0.21		0.031
SPA-8	J1TW68	7/29/14	7660		1.5	0.42	B	0.36	2.3		0.62	71.4		0.071	0.19		0.031
SPA-9	J1TW69	7/29/14	6610		1.3	0.33	U	0.33	2.1		0.57	60.9		0.066	0.17		0.028
SPA-10	J1TW70	7/29/14	6660		1.5	0.37	U	0.37	1.9		0.65	69.4		0.075	0.16	B	0.032
SPA-11	J1TW71	7/29/14	8770		1.5	0.51	B	0.37	2.4		0.64	83.1		0.073	0.26		0.032
SPA-12	J1TW72	7/29/14	8910		1.4	0.35	U	0.35	2.6		0.61	84.6		0.071	0.25		0.031
Equipment Blank	J1TW74	7/29/14	94.6		1.3	0.32	U	0.32	0.56	U	0.56	1.1		0.064	0.028	U	0.028

Grey cells indicate not applicable or data will not be used.

Acronyms and notes apply to all of the tables in this attachment.

Note: Data qualified with B, C, J, M, N, and/or X are considered acceptbale values.

B = estimated result. Result is less than the RL but greater than the MDL

C = the analyte was detected in both the sample and the associated QC blank, and the sample concentration was ≤ 5X the blank concentration.

EXC = excavation

HEIS = Hanford Environmental Information System

J = estimate

M = sample duplicate precision not met

N = recovery is outside control limits

PAH = polycyclic aromatic hydrocarbons

PCB = polychlorinated biphenyls

PQL = practical quantitative limit

Q = qualifier

R = rejected

SPA = staging pile area

SVOA = semivolatile organic analysis

U = undetected

X (metals) = serial dilution in the analytical batch indicates that physical and chemical interferences are present.

X (organics) = >40% difference between the primary and confirmation detector results. The lower of the two results is reported.

Attachment	1	Sheet No.	1 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	2.0		0.86	0.18		0.036	4730	X	12.4	9.0	X	0.051	8.0	X	0.088
Duplicate of J1TW48	J1TW60	6/26/14	1.7	B	0.97	0.15	B	0.041	4820	X	14.0	9.3	X	0.057	7.9	X	0.099
EXC-2	J1TW49	6/26/14	1.7	B	0.97	0.15	B	0.040	4050	X	13.9	9.2	X	0.057	7.6	X	0.098
EXC-3	J1TW50	6/26/14	0.93	U	0.93	0.14	B	0.039	5640	X	13.4	3.4	X	0.055	9.0	X	0.095
EXC-4	J1TW51	6/26/14	1.2	B	0.98	0.16	B	0.041	5350	X	14.1	4.9	X	0.058	8.2	X	0.10
EXC-5	J1TW52	6/26/14	3.1		0.97	0.16	B	0.041	10200	X	14.0	7.8	X	0.058	8.8	X	0.099
EXC-6	J1TW53	6/26/14	1.0	B	0.96	0.21		0.040	5360	X	13.9	8.9	X	0.057	8.4	X	0.098
EXC-7	J1TW54	6/26/14	0.95	B	0.84	0.15	B	0.035	6280	X	12.1	5.8	X	0.050	8.3	X	0.085
EXC-8	J1TW55	6/26/14	1.6	B	0.98	0.22		0.041	8490	X	14.1	9.9	X	0.058	8.7	X	0.10
EXC-9	J1TW56	6/26/14	0.87	U	0.87	0.15	B	0.036	7150	X	12.5	4.7	X	0.051	7.8	X	0.088
EXC-10	J1TW57	6/26/14	1.7	B	0.96	0.19	B	0.040	4610	X	13.9	14.0	X	0.057	8.7	X	0.098
EXC-11	J1TW58	6/26/14	1.4	B	0.97	0.17	B	0.041	6270	X	14.0	9.7	X	0.058	8.7	X	0.099
EXC-12	J1TW59	6/26/14	0.94	U	0.94	0.15	B	0.039	6070	X	13.6	7.9	X	0.056	8.3	X	0.096
SPA-1	J1TW61	7/29/14	1.4	B	0.88	0.037	U	0.037	3990	X	12.6	9.4	X	0.052	8.4	X	0.090
Duplicate of J1TW61	J1TW73	7/29/14	0.85	U	0.85	0.035	U	0.035	4150	X	12.2	10.0	X	0.050	8.4	X	0.087
SPA-2	J1TW62	7/29/14	2.2		0.90	0.038	U	0.038	4120	X	12.9	11.4	X	0.053	8.0	X	0.092
SPA-3	J1TW63	7/29/14	0.99	B	0.85	0.036	U	0.036	4870	X	12.3	7.7	X	0.051	8.4	X	0.087
SPA-4	J1TW64	7/29/14	1.1	B	0.90	0.038	U	0.038	4240	X	12.9	9.5	X	0.053	8.1	X	0.092
SPA-5	J1TW65	7/29/14	0.92	U	0.92	0.039	U	0.039	4910	X	13.3	7.9	X	0.055	8.5	X	0.094
SPA-6	J1TW66	7/29/14	0.86	U	0.86	0.036	U	0.036	4850	X	12.3	9.4	X	0.051	8.5	X	0.088
SPA-7	J1TW67	7/29/14	1.0	B	0.91	0.038	U	0.038	4320	X	13.1	11.2	X	0.054	8.6	X	0.093
SPA-8	J1TW68	7/29/14	0.92	U	0.92	0.039	U	0.039	4570	X	13.3	10.1	X	0.055	8.5	X	0.094
SPA-9	J1TW69	7/29/14	0.85	U	0.85	0.035	U	0.035	4540	X	12.2	8.5	X	0.050	8.4	X	0.086
SPA-10	J1TW70	7/29/14	1.3	B	0.96	0.040	U	0.040	4890	X	13.9	9.4	X	0.057	7.9	X	0.098
SPA-11	J1TW71	7/29/14	1.2	B	0.94	0.040	U	0.040	4390	X	13.6	11.0	X	0.056	9.3	X	0.096
SPA-12	J1TW72	7/29/14	1.8	B	0.91	0.038	U	0.038	4220	X	13.1	10.9	X	0.054	8.7	X	0.093
Equipment Blank	J1TW74	7/29/14	0.83	U	0.83	0.035	U	0.035	23.8	BX	12.0	0.1	BX	0.049	0.14	BX	0.085

Sample Location	HEIS Number	Sample Date	Copper			Hexavalent Chromium			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	13.6		0.19	0.155	UJ	0.155	21200	X	3.3	5.1		0.24	4560	X	3.3
Duplicate of J1TW48	J1TW60	6/26/14	14.0		0.22	0.155	UJ	0.155	21400	X	3.8	5.3		0.27	4500	X	3.7
EXC-2	J1TW49	6/26/14	14.0		0.21	0.155	UJ	0.155	20300	X	3.7	4.7		0.27	4240	X	3.6
EXC-3	J1TW50	6/26/14	13.4		0.21	0.199	J	0.155	23800	X	3.6	2.8		0.26	4140	X	3.5
EXC-4	J1TW51	6/26/14	16.4		0.22	0.155	UJ	0.155	20800	X	3.8	3.6		0.27	4320	X	3.7
EXC-5	J1TW52	6/26/14	16.1		0.22	0.155	UJ	0.155	23000	X	3.8	4.6		0.27	4830	X	3.7
EXC-6	J1TW53	6/26/14	14.6		0.21	0.282	J	0.155	22900	X	3.7	4.2		0.27	4370	X	3.6
EXC-7	J1TW54	6/26/14	14.7		0.19	0.199	J	0.155	22200	X	3.2	3.3		0.23	4430	X	3.2
EXC-8	J1TW55	6/26/14	17.5		0.22	0.155	UJ	0.155	22900	X	3.8	5.0		0.27	5070	X	3.7
EXC-9	J1TW56	6/26/14	14.2		0.19	0.155	UJ	0.155	21600	X	3.4	3.0		0.24	3920	X	3.3
EXC-10	J1TW57	6/26/14	16.2		0.21	0.155	UJ	0.155	22500	X	3.7	5.6		0.27	5400	X	3.6
EXC-11	J1TW58	6/26/14	16.0		0.22	0.155	UJ	0.155	22300	X	3.8	4.8		0.27	4840	X	3.7
EXC-12	J1TW59	6/26/14	15.5		0.21	0.220	J	0.155	20500	X	3.7	4.4		0.26	4790	X	3.6
SPA-1	J1TW61	7/29/14	14.4		0.19	0.266		0.155	22100	X	3.4	4.6		0.24	4830	X	3.3
Duplicate of J1TW61	J1TW73	7/29/14	14.3		0.19	0.367		0.155	21200	X	3.3	4.5		0.23	4750	X	3.2
SPA-2	J1TW62	7/29/14	13.9		0.20	0.155	U	0.155	21600	X	3.5	5.1		0.25	4920	X	3.4
SPA-3	J1TW63	7/29/14	15.6		0.19	0.245		0.155	22200	X	3.3	4.1		0.24	4530	X	3.2
SPA-4	J1TW64	7/29/14	13.2		0.20	0.283		0.155	21400	X	3.5	4.4		0.25	4730	X	3.4
SPA-5	J1TW65	7/29/14	14.2		0.20	0.288		0.155	23000	X	3.6	3.9		0.25	4810	X	3.5
SPA-6	J1TW66	7/29/14	13.8		0.19	0.324		0.155	23200	X	3.3	4.1		0.24	4760	X	3.2
SPA-7	J1TW67	7/29/14	14.3		0.20	0.304		0.155	22300	X	3.5	4.8		0.25	4980	X	3.4
SPA-8	J1TW68	7/29/14	14.6		0.20	0.304		0.155	22600	X	3.6	4.8		0.25	4850	X	3.5
SPA-9	J1TW69	7/29/14	15.8		0.19	0.283		0.155	22700	X	3.3	4.1		0.23	4750	X	3.2
SPA-10	J1TW70	7/29/14	20.5		0.21	0.155	U	0.155	20600	X	3.7	4.3		0.27	4570	X	3.6
SPA-11	J1TW71	7/29/14	15.3		0.21	0.367		0.155	23900	X	3.7	5.3		0.26	4880	X	3.6
SPA-12	J1TW72	7/29/14	14.0		0.20	0.450		0.155	22800	X	3.5	5.4		0.25	4840	X	3.4
Equipment Blank	J1TW74	7/29/14	0.38	B	0.18				154	X	3.2	0.23	U	0.23	11.3	BX	3.1

Attachment	1	Sheet No.	2 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Manganese			Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	321	X	0.088	0.0063	B	0.0053	0.53	B	0.23	10.2	X	0.11	1630		36.1
Duplicate of J1TW48	J1TW60	6/26/14	344	X	0.099	0.0059	B	0.0053	0.26	U	0.26	10.8	X	0.12	1700		40.6
EXC-2	J1TW49	6/26/14	290	X	0.098	0.012	B	0.0053	0.48	B	0.26	10.0	X	0.12	1340		40.4
EXC-3	J1TW50	6/26/14	294	X	0.095	0.0055	U	0.0055	0.25	U	0.25	7.2	X	0.12	632		39.0
EXC-4	J1TW51	6/26/14	262	X	0.10	0.0055	B	0.0052	0.26	U	0.26	8.7	X	0.12	884		41.1
EXC-5	J1TW52	6/26/14	345	X	0.099	0.0081	B	0.0054	0.26	U	0.26	10.4	X	0.12	1870		40.7
EXC-6	J1TW53	6/26/14	309	X	0.098	0.0053	U	0.0053	0.26	U	0.26	9.2	X	0.12	1070		40.4
EXC-7	J1TW54	6/26/14	278	X	0.085	0.0051	U	0.0051	0.22	U	0.22	8.7	X	0.11	779		35.0
EXC-8	J1TW55	6/26/14	322	X	0.10	0.077		0.0052	0.26	U	0.26	11.2	X	0.12	1300		41.1
EXC-9	J1TW56	6/26/14	282	X	0.088	0.0055	U	0.0055	0.23	U	0.23	6.9	X	0.11	945		36.2
EXC-10	J1TW57	6/26/14	359	X	0.098	0.0067	B	0.0054	0.26	U	0.26	13.7	X	0.12	1690		40.4
EXC-11	J1TW58	6/26/14	353	X	0.099	0.0074	B	0.0056	0.26	U	0.26	11.1	X	0.12	1490		40.7
EXC-12	J1TW59	6/26/14	385	X	0.096	0.0056	B	0.0055	0.25	U	0.25	9.7	X	0.12	1040		39.4
SPA-1	J1TW61	7/29/14	350	X	0.090	0.0088	B	0.0057	0.45	B	0.23	10.8	X	0.11	1360		36.8
Duplicate of J1TW61	J1TW73	7/29/14	312	X	0.087	0.0092	B	0.0051	0.23	U	0.23	11.9	X	0.11	1420		35.5
SPA-2	J1TW62	7/29/14	341	X	0.092	0.022		0.0055	0.37	B	0.24	12.0	X	0.11	1940		37.6
SPA-3	J1TW63	7/29/14	295	X	0.087	0.0094	B	0.0063	0.23	U	0.23	9.4	X	0.11	975		35.8
SPA-4	J1TW64	7/29/14	301	X	0.092	0.0088	B	0.0051	0.24	U	0.24	11.3	X	0.11	1150		37.6
SPA-5	J1TW65	7/29/14	296	X	0.094	0.0082	B	0.0054	0.24	U	0.24	11.0	X	0.12	798		38.5
SPA-6	J1TW66	7/29/14	310	X	0.088	0.0082	B	0.0049	0.25	B	0.23	10.2	X	0.11	975		35.9
SPA-7	J1TW67	7/29/14	318	X	0.093	0.0095	B	0.0056	0.24	U	0.24	12.6	X	0.11	1220		38.1
SPA-8	J1TW68	7/29/14	321	X	0.094	0.0090	B	0.0048	0.24	U	0.24	11.6	X	0.12	1140		38.5
SPA-9	J1TW69	7/29/14	305	X	0.086	0.0084	B	0.0051	0.22	U	0.22	11.1	X	0.11	917		35.4
SPA-10	J1TW70	7/29/14	296	X	0.098	0.0095	B	0.0054	0.26	U	0.26	10.5	X	0.12	1260		40.3
SPA-11	J1TW71	7/29/14	382	X	0.096	0.0079	B	0.0054	0.25	U	0.25	11.8	X	0.12	1660		39.5
SPA-12	J1TW72	7/29/14	357	X	0.093	0.0087	B	0.0054	0.24	U	0.24	11.5	X	0.11	1700		38.1
Equipment Blank	J1TW74	7/29/14	2.9	X	0.085	0.0061	U	0.0061	0.22	U	0.22	0.18	BXC	0.10	34.8	U	34.8

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	0.76	U	0.76	438	NJX	5.0	0.14	U	0.14	230		52.0	49.8		0.083
Duplicate of J1TW48	J1TW60	6/26/14	0.85	U	0.85	450	NJX	5.6	0.16	U	0.16	249		58.5	47.8		0.093
EXC-2	J1TW49	6/26/14	0.85	B	0.85	533	NJX	5.6	0.16	U	0.16	226		58.1	46.1		0.093
EXC-3	J1TW50	6/26/14	0.82	U	0.82	280	NJX	5.4	0.15	U	0.15	248		56.2	59.8		0.090
EXC-4	J1TW51	6/26/14	0.86	U	0.86	393	NJX	5.7	0.16	U	0.16	334		59.1	49.7		0.094
EXC-5	J1TW52	6/26/14	0.85	U	0.85	479	NJX	5.6	0.16	U	0.16	259		58.6	55.4		0.093
EXC-6	J1TW53	6/26/14	0.85	U	0.85	564	NJX	5.6	0.16	U	0.16	264		58.1	57.0		0.093
EXC-7	J1TW54	6/26/14	0.74	U	0.74	234	NJX	4.8	0.14	U	0.14	259		50.4	56.0		0.080
EXC-8	J1TW55	6/26/14	0.86	U	0.86	479	NJX	5.7	0.16	U	0.16	270		59.1	54.8		0.094
EXC-9	J1TW56	6/26/14	0.76	U	0.76	255	NJX	5.0	0.14	U	0.14	251		52.1	54.5		0.083
EXC-10	J1TW57	6/26/14	0.85	U	0.85	715	NJX	5.6	0.16	U	0.16	251		58.1	48.7		0.093
EXC-11	J1TW58	6/26/14	0.85	U	0.85	418	NJX	5.6	0.16	U	0.16	265		58.6	50.7		0.093
EXC-12	J1TW59	6/26/14	0.83	U	0.83	328	NJX	5.4	0.15	U	0.15	280		56.7	46.7		0.090
SPA-1	J1TW61	7/29/14	0.77	U	0.77	328	NX	5.1	0.14	U	0.14	219		52.9	51.0		0.084
Duplicate of J1TW61	J1TW73	7/29/14	0.74	U	0.74	299	X	4.9	0.14	U	0.14	241		51.1	49.6		0.081
SPA-2	J1TW62	7/29/14	0.89	B	0.79	334	X	5.2	0.15	U	0.15	264		54.0	46.8		0.086
SPA-3	J1TW63	7/29/14	0.75	U	0.75	227	X	4.9	0.14	U	0.14	322		51.5	53.3		0.082
SPA-4	J1TW64	7/29/14	0.79	U	0.79	248	X	5.2	0.15	U	0.15	250		54.2	50.2		0.086
SPA-5	J1TW65	7/29/14	0.81	U	0.81	282	X	5.3	0.15	U	0.15	279		55.5	56.2		0.088
SPA-6	J1TW66	7/29/14	0.75	U	0.75	193	X	5.0	0.14	U	0.14	274		51.6	57.3		0.082
SPA-7	J1TW67	7/29/14	0.80	U	0.80	249	X	5.3	0.15	U	0.15	242		54.8	55.5		0.087
SPA-8	J1TW68	7/29/14	0.81	U	0.81	254	X	5.3	0.15	U	0.15	290		55.5	55.8		0.088
SPA-9	J1TW69	7/29/14	0.74	U	0.74	272	X	4.9	0.14	U	0.14	265		50.9	55.9		0.081
SPA-10	J1TW70	7/29/14	0.84	U	0.84	219	X	5.6	0.16	U	0.16	223		58.0	49.1		0.092
SPA-11	J1TW71	7/29/14	0.83	U	0.83	322	X	5.5	0.15	U	0.15	219		56.9	54.8		0.091
SPA-12	J1TW72	7/29/14	0.80	U	0.80	298	X	5.3	0.15	U	0.15	261		54.8	53.2		0.087
Equipment Blank	J1TW74	7/29/14	0.73	U	0.73	69.8	X	4.8	0.14	U	0.14	50	U	50.0	0.14	B	0.080

Attachment	1	Sheet No.	3 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	43.2	X	0.35
Duplicate of J1TW48	J1TW60	6/26/14	42.9	X	0.39
EXC-2	J1TW49	6/26/14	42.6	X	0.39
EXC-3	J1TW50	6/26/14	41.5	X	0.38
EXC-4	J1TW51	6/26/14	40.5	X	0.40
EXC-5	J1TW52	6/26/14	45.6	X	0.40
EXC-6	J1TW53	6/26/14	44.5	X	0.39
EXC-7	J1TW54	6/26/14	40.9	X	0.34
EXC-8	J1TW55	6/26/14	48.5	X	0.40
EXC-9	J1TW56	6/26/14	38.6	X	0.35
EXC-10	J1TW57	6/26/14	45.5	X	0.39
EXC-11	J1TW58	6/26/14	44.7	X	0.40
EXC-12	J1TW59	6/26/14	38.8	X	0.38
SPA-1	J1TW61	7/29/14	41.9	X	0.36
Duplicate of J1TW61	J1TW73	7/29/14	40.7	X	0.34
SPA-2	J1TW62	7/29/14	42.3	X	0.36
SPA-3	J1TW63	7/29/14	40.3	X	0.35
SPA-4	J1TW64	7/29/14	40.3	X	0.37
SPA-5	J1TW65	7/29/14	41.1	X	0.37
SPA-6	J1TW66	7/29/14	41.6	X	0.35
SPA-7	J1TW67	7/29/14	42.1	X	0.37
SPA-8	J1TW68	7/29/14	42.9	X	0.37
SPA-9	J1TW69	7/29/14	42.0	X	0.34
SPA-10	J1TW70	7/29/14	40.7	X	0.39
SPA-11	J1TW71	7/29/14	44.5	X	0.38
SPA-12	J1TW72	7/29/14	43.3	X	0.37
Equipment Blank	J1TW74	7/29/14	0.73	BXC	0.34

Attachment	1	Sheet No.	4 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Anions, pH, and Physical).

Sample Location	Sample Number	Sample Date	Bromide			Chloride			Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TW48	6/26/14	0.38	UN	0.38	10.3	N	1.9	1.2	JBN	0.79	9.2	JN	0.30	10.3		0.36
Duplicate of J1TW48	J1TW60	6/26/14	0.38	U	0.38	10.8	N	1.9	1.6	JBN	0.80	9.6	JN	0.31	8.5		0.36
EXC-2	J1TW49	6/26/14	0.38	U	0.38	6.4		2.0	1.4	JB	0.81	2.3	JB	0.31	2.1		0.36
EXC-3	J1TW50	6/26/14	0.37	U	0.37	5.5		1.9	0.92	JB	0.78	1.2	JB	0.30	0.36	U	0.36
EXC-4	J1TW51	6/26/14	0.39	U	0.39	6.5		2.0	1.3	JB	0.82	4.9	J	0.31	3.1		0.36
EXC-5	J1TW52	6/26/14	0.39	U	0.39	11.0		2.0	1.8	JB	0.82	9.7	J	0.31	8.3		0.36
EXC-6	J1TW53	6/26/14	0.38	U	0.38	7.0		2.0	1.7	JB	0.81	2.3	JB	0.31	1.4		0.36
EXC-7	J1TW54	6/26/14	0.39	U	0.39	5.8		2.0	1.4	JB	0.81	1.5	JB	0.31	0.48	B	0.36
EXC-8	J1TW55	6/26/14	0.39	U	0.39	6.5		2.0	1.7	JB	0.82	2.5	J	0.31	2.5		0.36
EXC-9	J1TW56	6/26/14	0.37	U	0.37	6.0		1.9	1.1	JB	0.79	1.8	JB	0.30	0.61	BM	0.36
EXC-10	J1TW57	6/26/14	0.37	U	0.37	5.6		1.9	1.7	JB	0.78	1.1	JB	0.30	0.49	B	0.36
EXC-11	J1TW58	6/26/14	0.39	U	0.39	7.5		2.0	1.9	JB	0.82	2.5	J	0.31	1.2		0.36
EXC-12	J1TW59	6/26/14	0.39	U	0.39	6.8		2.0	1.4	JB	0.81	0.93	JB	0.31	0.36	U	0.36
SPA-1	J1TW61	7/29/14	0.39	U	0.39	7.2	N	2.0	0.82	U	0.82	2.8		0.32	2.5		0.37
Duplicate of J1TW61	J1TW73	7/29/14	0.39	U	0.39	56.5	M	2.0	2.9	B	0.81	3.0		0.31	2.8		0.37
SPA-2	J1TW62	7/29/14	0.40	U	0.40	92.1		2.0	4.4	B	0.83	9.0		0.32	8.1		0.37
SPA-3	J1TW63	7/29/14	0.40	U	0.40	84.0		2.0	4.2	B	0.84	5.5		0.32	5.4		0.37
SPA-4	J1TW64	7/29/14	0.39	U	0.39	76.4		2.0	4.4	B	0.81	4.0		0.31	4.6		0.36
SPA-5	J1TW65	7/29/14	0.39	U	0.39	85.4		2.0	4.0	B	0.82	2.0	B	0.32	1.3		0.37
SPA-6	J1TW66	7/29/14	0.39	U	0.39	73.3		2.0	4.1	B	0.82	2.2	B	0.31	1.9		0.36
SPA-7	J1TW67	7/29/14	0.39	U	0.39	74.3		2.0	3.7	B	0.82	2.1	B	0.31	1.4		0.36
SPA-8	J1TW68	7/29/14	0.39	U	0.39	70.5		2.0	3.6	B	0.82	2.4	B	0.31	1.9		0.36
SPA-9	J1TW69	7/29/14	0.40	U	0.40	78.1		2.0	3.9	B	0.83	3.3		0.32	2.5		0.36
SPA-10	J1TW70	7/29/14	0.39	U	0.39	78.7		2.0	3.4	B	0.83	4.9		0.32	5.0		0.37
SPA-11	J1TW71	7/29/14	0.39	U	0.39	77.1		2.0	3.3	B	0.81	3.1		0.31	2.9		0.37
SPA-12	J1TW72	7/29/14	0.38	U	0.38	69.6		2.0	3.6	B	0.81	6.7		0.31	8.2		0.37

Sample Location	Sample Number	Sample Date	Nitrogen in Nitrite			Phosphorous in phosphate			Sulfate			Percent moisture (wet sample)			pH Measurement		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	%	Q	PQL	pH	Q	PQL
EXC-1	J1TW48	6/26/14	0.33	URN	0.33	1.2	URN	1.2	10.1	JN	1.6	1.3		0.10	8.60		0.10
Duplicate of J1TW48	J1TW60	6/26/14	0.33	URN	0.33	1.2	UN	1.2	10.7	JN	1.7	1.1		0.10	8.54		0.10
EXC-2	J1TW49	6/26/14	0.33	UR	0.33	1.2	UR	1.2	5.2	J	1.7	1.4		0.10	8.87		0.10
EXC-3	J1TW50	6/26/14	0.32	UR	0.32	1.2	UR	1.2	3.6	JB	1.6	0.94		0.10	9.14		0.10
EXC-4	J1TW51	6/26/14	0.34	UR	0.34	2.5	JB	1.2	5.9	J	1.7	1.1		0.10	8.68		0.10
EXC-5	J1TW52	6/26/14	0.34	UR	0.34	3.6	JB	1.2	9.1	J	1.7	1.2		0.10	8.93		0.10
EXC-6	J1TW53	6/26/14	0.33	UR	0.33	1.2	UR	1.2	7.7	J	1.7	1.4		0.10	9.00		0.10
EXC-7	J1TW54	6/26/14	0.33	UR	0.33	2.3	JB	1.2	4.3	JB	1.7	0.86		0.10	8.87		0.10
EXC-8	J1TW55	6/26/14	0.34	UR	0.34	2.4	JB	1.2	6.7	J	1.7	1.2		0.10	8.68		0.10
EXC-9	J1TW56	6/26/14	0.32	UR	0.32	1.2	UR	1.2	6.0	J	1.6	0.74		0.10	9.27		0.10
EXC-10	J1TW57	6/26/14	0.32	UR	0.32	1.2	UR	1.2	4.2	JB	1.6	1.4		0.10	8.82		0.10
EXC-11	J1TW58	6/26/14	0.33	UR	0.33	1.2	UR	1.2	6.8	J	1.7	1.3		0.10	8.95		0.10
EXC-12	J1TW59	6/26/14	0.33	UR	0.33	1.2	UR	1.2	29.5	J	1.7	0.91		0.10	9.21		0.10
SPA-1	J1TW61	7/29/14	0.34	U	0.34	1.2	U	1.2	7.2	N	1.7	2.1		0.10			
Duplicate of J1TW61	J1TW73	7/29/14	0.33	U	0.33	1.2	UN	1.2	7.2		1.7	2.1		0.10			
SPA-2	J1TW62	7/29/14	0.34	U	0.34	1.3	U	1.3	17.7		1.7	2.5		0.10			
SPA-3	J1TW63	7/29/14	0.34	U	0.34	1.3	U	1.3	8.3		1.7	2.0		0.10			
SPA-4	J1TW64	7/29/14	0.33	U	0.33	1.2	U	1.2	14.1		1.7	1.9		0.10			
SPA-5	J1TW65	7/29/14	0.34	U	0.34	1.2	U	1.2	7.8		1.7	3.3		0.10			
SPA-6	J1TW66	7/29/14	0.34	U	0.34	1.2	U	1.2	12.5		1.7	1.5		0.10			
SPA-7	J1TW67	7/29/14	0.34	U	0.34	1.2	U	1.2	6.5		1.7	1.2		0.10			
SPA-8	J1TW68	7/29/14	0.34	U	0.34	1.2	U	1.2	69.4		1.7	1.5		0.10			
SPA-9	J1TW69	7/29/14	0.34	U	0.34	1.3	U	1.3	7.5		1.7	1.8		0.10			
SPA-10	J1TW70	7/29/14	0.34	U	0.34	1.8	B	1.3	8.6		1.7	2.1		0.10			
SPA-11	J1TW71	7/29/14	0.33	U	0.33	1.2	U	1.2	7.7		1.7	2.2		0.10			
SPA-12	J1TW72	7/29/14	0.33	U	0.33	1.2	U	1.2	11.6		1.7	3.0		0.10			
Equipment Blank	J1TW74	7/29/14										0.10	U	0.10			

Attachment	1	Sheet No.	5 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-1 - J1TW48			Duplicate of J1TW48 - J1TW60			EXC-2 - J1TW49			EXC-3 - J1TW50			EXC-4 - J1TW51		
		6/26/14			6/26/14			6/26/14			6/26/14			6/26/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.7	U	9.7	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	8.7	U	8.7	8.7	U	8.7	9.0	U	9.0	9.1	U	9.1	8.8	U	8.8
Anthracene	PAH	3.0	U	3.0	2.9	U	2.9	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	5.5	JX	3.1	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	6.2	U	6.2	8.6	JX	6.2	6.4	U	6.4	6.4	U	6.4	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.1	U	4.1	11	JX	4	4.2	U	4.2	4.2	U	4.2	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.0	U	7.0	6.9	U	6.9	7.2	U	7.2	7.2	U	7.2	7.0	U	7.0
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.8	U	3.8	3.9	U	3.9	4.0	U	4.0	3.8	U	3.8
Chrysene	PAH	4.7	U	4.7	6.2	J	4.7	4.8	U	4.8	4.9	U	4.9	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.1	U	5.1	5.1	U	5.1	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1221	PCB	7.6	U	7.6	7.6	U	7.6	7.6	U	7.6	7.6	U	7.6	7.4	U	7.4
Aroclor-1232	PCB	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.8	U	1.8
Aroclor-1242	PCB	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.3	U	4.3
Aroclor-1248	PCB	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4	4.3	U	4.3
Aroclor-1254	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.4	U	2.4
Aroclor-1260	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.4	U	2.4

CONSTITUENT	CLASS	EXC-5 - J1TW52			EXC-6 - J1TW53			EXC-7 - J1TW54			EXC-8 - J1TW55			EXC-9 - J1TW56		
		6/26/14			6/26/14			6/26/14			6/26/14			6/26/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.8	U	9.8	9.4	U	9.4	9.6	U	9.6	9.9	U	9.9	9.9	U	9.9
Acenaphthylene	PAH	8.8	U	8.8	8.5	U	8.5	8.7	U	8.7	8.9	U	8.9	8.9	U	8.9
Anthracene	PAH	3.0	U	3.0	2.9	U	2.9	2.9	U	2.9	3.0	U	3.0	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.2	U	3.2
Benzo(a)pyrene	PAH	6.3	U	6.3	6.1	U	6.1	6.2	U	6.2	6.3	U	6.3	6.4	U	6.4
Benzo(b)fluoranthene	PAH	4.1	U	4.1	4.0	U	4.0	4.0	U	4.0	4.1	U	4.1	4.2	U	4.2
Benzo(ghi)perylene	PAH	7.1	U	7.1	6.8	U	6.8	6.9	U	6.9	7.1	U	7.1	7.2	U	7.2
Benzo(k)fluoranthene	PAH	3.9	U	3.9	3.7	U	3.7	3.8	U	3.8	3.9	U	3.9	3.9	U	3.9
Chrysene	PAH	4.8	U	4.8	4.6	U	4.6	4.7	U	4.7	4.8	U	4.8	4.8	U	4.8
Dibenz[a,h]anthracene	PAH	11	U	11	10	U	10	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.2	U	5.2	5.0	U	5.0	5.1	U	5.1	5.2	U	5.2	5.2	U	5.2
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7	2.6	U	2.6
Aroclor-1221	PCB	7.9	U	7.9	7.4	U	7.4	7.5	U	7.5	7.8	U	7.8	7.6	U	7.6
Aroclor-1232	PCB	2.0	U	2.0	1.8	U	1.8	1.9	U	1.9	2.0	U	2.0	1.9	U	1.9
Aroclor-1242	PCB	4.6	U	4.6	4.3	U	4.3	4.4	U	4.4	4.6	U	4.6	4.4	U	4.4
Aroclor-1248	PCB	4.6	U	4.6	4.3	U	4.3	4.4	U	4.4	4.6	U	4.6	4.4	U	4.4
Aroclor-1254	PCB	2.6	U	2.6	2.4	U	2.4	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4
Aroclor-1260	PCB	2.6	U	2.6	2.4	U	2.4	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4

Attachment	1	Sheet No.	6 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-10 - J1TW57			EXC-11 - J1TW58			EXC-12 - J1TW59			SPA-1 - J1TW61			Duplicate of J1TW61 - J1TW73		
		6/26/14			6/26/14			6/26/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.9	U	9.9	10	U	10	10	U	10	9.6	U	9.6	9.6	U	9.6
Acenaphthylene	PAH	8.9	U	8.9	9.1	U	9.1	9.0	U	9.0	8.6	U	8.6	8.6	U	8.6
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	2.9	U	2.9	2.9	U	2.9
Benzo(a)anthracene	PAH	3.2	U	3.2	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1
Benzo(a)pyrene	PAH	6.4	U	6.4	6.5	U	6.5	6.4	U	6.4	6.1	U	6.1	6.1	U	6.1
Benzo(b)fluoranthene	PAH	4.2	U	4.2	4.2	U	4.2	4.2	U	4.2	4.0	U	4.0	4.0	U	4.0
Benzo(ghi)perylene	PAH	7.1	U	7.1	7.3	U	7.3	7.2	U	7.2	6.9	U	6.9	6.9	U	6.9
Benzo(k)fluoranthene	PAH	3.9	U	3.9	4.0	U	4.0	4.0	U	4.0	3.8	U	3.8	3.8	U	3.8
Chrysene	PAH	4.8	U	4.8	4.9	U	4.9	4.9	U	4.9	4.6	U	4.6	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	12	U	12	12	U	12
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	11	U	11	11	U	11
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	11	U	11	11	U	11
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	11	U	11	11	U	11
Pyrene	PAH	12	U	12	12	U	12	12	U	12	11	U	11	11	U	11
Aroclor-1016	PCB	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6
Aroclor-1221	PCB	7.8	U	7.8	7.7	U	7.7	7.8	U	7.8	7.9	U	7.9	7.5	U	7.5
Aroclor-1232	PCB	2.0	U	2.0	1.9	U	1.9	1.9	U	1.9	2.0	U	2.0	1.9	U	1.9
Aroclor-1242	PCB	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5	4.6	U	4.6	4.3	U	4.3
Aroclor-1248	PCB	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5	4.6	U	4.6	4.3	U	4.3
Aroclor-1254	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.4	U	2.4
Aroclor-1260	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.4	U	2.4

CONSTITUENT	CLASS	SPA-2 - J1TW62			SPA-3 - J1TW63			SPA-4 - J1TW64			SPA-5 - J1TW65			SPA-6 - J1TW66		
		7/29/14			7/29/14			7/29/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	9.7	U	9.7	9.7	U	9.7	10	U	10	9.4	U	9.4
Acenaphthylene	PAH	9.1	U	9.1	8.7	U	8.7	8.7	U	8.7	9.0	U	9.0	8.4	U	8.4
Anthracene	PAH	3.1	U	3.1	2.9	U	2.9	3.0	U	3.0	3.1	U	3.1	2.9	U	2.9
Benzo(a)anthracene	PAH	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1	3.2	U	3.2	3.0	U	3.0
Benzo(a)pyrene	PAH	6.5	U	6.5	6.2	U	6.2	6.2	U	6.2	6.4	U	6.4	6.0	U	6.0
Benzo(b)fluoranthene	PAH	4.2	U	4.2	4.1	U	4.1	4.1	U	4.1	4.2	U	4.2	3.9	U	3.9
Benzo(ghi)perylene	PAH	7.3	U	7.3	7.0	U	7.0	7.0	U	7.0	7.2	U	7.2	6.7	U	6.7
Benzo(k)fluoranthene	PAH	4.0	U	4.0	3.8	U	3.8	3.8	U	3.8	3.9	U	3.9	3.7	U	3.7
Chrysene	PAH	4.9	U	4.9	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8	4.5	U	4.5
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	10	U	10
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13	12	U	12
Fluorene	PAH	5.3	U	5.3	5.1	U	5.1	5.1	U	5.1	5.3	U	5.3	4.9	U	4.9
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.6	U	2.6	2.7	U	2.7	2.8	U	2.8
Aroclor-1221	PCB	8.1	U	8.1	8.0	U	8.0	7.6	U	7.6	7.9	U	7.9	8.0	U	8.0
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.7	U	4.7	4.4	U	4.4	4.6	U	4.6	4.7	U	4.7
Aroclor-1248	PCB	4.7	U	4.7	4.7	U	4.7	4.4	U	4.4	4.6	U	4.6	4.7	U	4.7
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6

Attachment	1	Sheet No.	7 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-7 - J1TW67			SPA-8 - J1TW68			SPA-9 - J1TW69			SPA-10 - J1TW70			SPA-11 - J1TW71		
		7/29/14			7/29/14			7/29/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.7	U	9.7	9.3	U	9.3	9.7	U	9.7	9.3	U	9.3	9.4	U	9.4
Acenaphthylene	PAH	8.8	U	8.8	8.4	U	8.4	8.7	U	8.7	8.4	U	8.4	8.5	U	8.5
Anthracene	PAH	3.0	U	3.0	2.8	U	2.8	3.0	U	3.0	2.8	U	2.8	2.9	U	2.9
Benzo(a)anthracene	PAH	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.0	U	3.0	3.0	U	3.0
Benzo(a)pyrene	PAH	6.2	U	6.2	6.0	U	6.0	6.2	U	6.2	6.0	U	6.0	6.0	U	6.0
Benzo(b)fluoranthene	PAH	4.1	U	4.1	3.9	U	3.9	4.1	U	4.1	3.9	U	3.9	4.0	U	4.0
Benzo(ghi)perylene	PAH	7.0	U	7.0	6.7	U	6.7	7.0	U	7.0	6.7	U	6.7	6.8	U	6.8
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.7	U	3.7	3.8	U	3.8	3.7	U	3.7	3.7	U	3.7
Chrysene	PAH	4.7	U	4.7	4.5	U	4.5	4.7	U	4.7	4.5	U	4.5	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	11	U	11	10	U	10	11	U	11	10	U	10	10	U	10
Fluoranthene	PAH	13	U	13	12	U	12	13	U	13	12	U	12	12	U	12
Fluorene	PAH	5.1	U	5.1	4.9	U	4.9	5.1	U	5.1	4.9	U	4.9	5.0	U	5.0
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Naphthalene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Phenanthrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Pyrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Aroclor-1016	PCB	2.6	U	2.6	2.7	U	2.7	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1221	PCB	7.5	U	7.5	7.7	U	7.7	7.5	U	7.5	7.6	U	7.6	7.5	U	7.5
Aroclor-1232	PCB	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9	1.9	U	1.9
Aroclor-1242	PCB	4.4	U	4.4	4.5	U	4.5	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4
Aroclor-1248	PCB	4.4	U	4.4	4.5	U	4.5	4.4	U	4.4	4.4	U	4.4	4.4	U	4.4
Aroclor-1254	PCB	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4
Aroclor-1260	PCB	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4	2.5	U	2.5	2.4	U	2.4

CONSTITUENT	CLASS	SPA-12 - J1TW72		
		7/29/14		
		ug/kg	Q	PQL
Acenaphthene	PAH	9.5	U	9.5
Acenaphthylene	PAH	8.6	U	8.6
Anthracene	PAH	2.9	U	2.9
Benzo(a)anthracene	PAH	3.0	U	3.0
Benzo(a)pyrene	PAH	6.1	U	6.1
Benzo(b)fluoranthene	PAH	4.0	U	4.0
Benzo(ghi)perylene	PAH	6.9	U	6.9
Benzo(k)fluoranthene	PAH	3.8	U	3.8
Chrysene	PAH	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	10	U	10
Fluoranthene	PAH	12	U	12
Fluorene	PAH	5.0	U	5.0
Indeno(1,2,3-cd)pyrene	PAH	11	U	11
Naphthalene	PAH	11	U	11
Phenanthrene	PAH	11	U	11
Pyrene	PAH	11	U	11
Aroclor-1016	PCB	2.7	U	2.7
Aroclor-1221	PCB	7.7	U	7.7
Aroclor-1232	PCB	1.9	U	1.9
Aroclor-1242	PCB	4.5	U	4.5
Aroclor-1248	PCB	4.5	U	4.5
Aroclor-1254	PCB	2.5	U	2.5
Aroclor-1260	PCB	2.5	U	2.5

Attachment	1	Sheet No.	8 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-1 - J1TW48			Duplicate of J1TW48 - J1TW60			EXC-2 - J1TW49			EXC-3 - J1TW50			EXC-4 - J1TW51		
		6/26/14			6/26/14			6/26/14			6/26/14			6/26/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	27	U	27	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
2,4,6-Trichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
2,4-Dichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
2,4-Dimethylphenol	SVOA	63	U	63	63	U	63	63	U	63	66	U	66	66	U	66
2,4-Dinitrophenol	SVOA	320	UJX	320	320	UJ	320	320	UJ	320	340	UJ	340	330	UJX	330
2,4-Dinitrotoluene	SVOA	63	U	63	63	U	63	63	U	63	66	U	66	66	U	66
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	27	U	27	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
2-Chlorophenol	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	12	U	12	13	U	13	13	U	13
2-Nitroaniline	SVOA	48	U	48	47	U	47	48	U	48	50	U	50	50	U	50
2-Nitrophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
3,3'-Dichlorobenzidine	SVOA	87	U	87	85	U	85	86	U	86	91	U	91	90	U	90
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	31	U	31	32	U	32	33	U	33	33	U	33
3-Nitroaniline	SVOA	70	U	70	69	U	69	70	U	70	73	U	73	73	U	73
4,6-Dinitro-2-methylphenol	SVOA	320	UX	320	310	U	310	320	U	320	330	U	330	330	U	330
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	63	U	63	63	U	63	63	U	63	66	U	66	66	U	66
4-Chloroaniline	SVOA	79	U	79	78	UJ	78	79	U	79	82	UJ	82	81	UJ	81
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	21	U	21
4-Nitroaniline	SVOA	70	U	70	69	U	69	70	U	70	73	U	73	72	U	72
4-Nitrophenol	SVOA	93	U	93	92	U	92	93	U	93	98	U	98	96	U	96
Acenaphthene	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
Acenaphthylene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	17	U	17
Anthracene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	25	U	25	25	U	25	25	U	25	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	15	U	15	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	38	U	38	38	U	38	38	U	38	40	U	40	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	44	U	44	44	U	44	46	U	46	46	U	46
Butylbenzylphthalate	SVOA	41	U	41	41	U	41	41	U	41	43	U	43	43	U	43
Carbazole	SVOA	35	U	35	34	U	34	35	U	35	36	U	36	36	U	36
Chrysene	SVOA	26	U	26	26	U	26	26	U	26	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	19	U	19
Dibenzofuran	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	20	U	20
Diethyl phthalate	SVOA	25	U	25	25	U	25	25	U	25	26	U	26	26	U	26
Dimethyl phthalate	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	34	U	34	35	U	35	36	U	36	36	U	36
Fluorene	SVOA	17	U	17	17	U	17	17	U	17	18	U	18	18	U	18
Hexachlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.9	U	9.9
Hexachlorocyclopentadiene	SVOA	48	U	48	47	U	47	48	U	48	50	U	50	50	U	50
Hexachloroethane	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	22	U	22
Isophorone	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	29	U	29	30	U	30	31	U	31	31	U	31
Nitrobenzene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	29	U	29	30	U	30	31	U	31	31	U	31
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	21	U	21
Pentachlorophenol	SVOA	320	U	320	310	U	310	320	U	320	330	U	330	330	U	330
Phenanthrene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	17	U	17
Phenol	SVOA	17	U	17	17	U	17	17	U	17	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	9 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-5 - J1TW52			EXC-6 - J1TW53			EXC-7 - J1TW54			EXC-8 - J1TW55			EXC-9 - J1TW56		
		6/26/14			6/26/14			6/26/14			6/26/14			6/26/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	27	U	27	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
2,4-Dimethylphenol	SVOA	64	U	64	65	U	65	64	U	64	64	U	64	63	U	63
2,4-Dinitrophenol	SVOA	320	UJ	320	330	UJ	330	330	UJ	330	320	UJ	320	320	UJ	320
2,4-Dinitrotoluene	SVOA	64	U	64	65	U	65	64	U	64	64	U	64	63	U	63
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	27	U	27	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	48	U	48	49	U	49	49	U	49	49	U	49	48	U	48
2-Nitrophenol	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	87	U	87	88	U	88	88	U	88	88	U	88	86	U	86
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	32	U	32	32	U	32	32	U	32	31	U	31
3-Nitroaniline	SVOA	71	U	71	71	U	71	71	U	71	71	U	71	69	U	69
4,6-Dinitro-2-methylpheno	SVOA	320	U	320	320	U	320	320	U	320	320	U	320	310	U	310
4-Bromophenylphenyl ethe	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
4-Chloro-3-methylpheno	SVOA	64	U	64	65	U	65	64	U	64	64	U	64	63	U	63
4-Chloroaniline	SVOA	79	U	79	80	UJ	80	80	U	80	80	U	80	78	UJ	78
4-Chlorophenylphenyl ethe	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
4-Nitroaniline	SVOA	70	U	70	71	U	71	71	U	71	71	U	71	69	U	69
4-Nitrophenol	SVOA	94	U	94	95	U	95	95	U	95	94	U	94	92	U	92
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	9.8	U	9.8
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	26	U	26	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	39	U	39	39	U	39	39	U	39	39	U	39	38	U	38
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Bis(2-chloroethyl) ethe	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	45	U	45	45	U	45	45	U	45	44	U	44
Butylbenzylphthalate	SVOA	42	U	42	42	U	42	42	U	42	42	U	42	41	U	41
Carbazole	SVOA	35	U	35	35	U	35	35	U	35	35	U	35	34	U	34
Chrysene	SVOA	26	U	26	26	U	26	26	U	26	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19
Diethyl phthalate	SVOA	25	U	25	25	U	25	25	U	25	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	28	U	28	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	35	U	35	35	U	35	35	U	35	34	U	34
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	28	U	28	28	U	28	28	U	28	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	9.7	U	9.7	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	48	U	48	49	U	49	49	U	49	49	U	49	48	U	48
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Naphthalene	SVOA	30	U	30	30	U	30	30	U	30	30	U	30	29	U	29
Nitrobenzene	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	30	U	30	30	U	30	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
Pentachlorophenol	SVOA	320	U	320	320	U	320	320	U	320	320	U	320	310	U	310
Phenanthrene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Phenol	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	10 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-10 - J1TW57			EXC-11 - J1TW58			EXC-12 - J1TW59			SPA-1 - J1TW61			Duplicate of J1TW61 - J1TW73		
		6/26/14			6/26/14			6/26/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	27	U	27	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	11	U	11	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4-Dimethylphenol	SVOA	63	U	63	62	U	62	63	U	63	66	U	66	63	U	63
2,4-Dinitrophenol	SVOA	320	UJ	320	320	UJ	320	320	UJ	320	330	U	330	320	U	320
2,4-Dinitrotoluene	SVOA	63	U	63	62	U	62	63	U	63	66	U	66	63	U	63
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	27	U	27	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	12	U	12	13	U	13	12	U	12
2-Nitroaniline	SVOA	48	U	48	47	U	47	48	U	48	50	U	50	48	U	48
2-Nitrophenol	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	86	U	86	85	U	85	86	U	86	90	U	90	86	U	86
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	31	U	31	32	U	32	33	U	33	31	U	31
3-Nitroaniline	SVOA	70	U	70	69	U	69	70	U	70	73	U	73	69	U	69
4,6-Dinitro-2-methylpheno	SVOA	320	U	320	310	U	310	320	U	320	330	U	330	310	U	310
4-Bromophenylphenyl ethe	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	18	U	18
4-Chloro-3-methylpheno	SVOA	63	U	63	62	U	62	63	U	63	66	U	66	63	U	63
4-Chloroaniline	SVOA	79	UJ	79	78	UJ	78	78	U	78	82	U	82	78	U	78
4-Chlorophenylphenyl ethe	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	20	U	20
4-Nitroaniline	SVOA	70	U	70	69	U	69	69	U	69	73	U	73	69	U	69
4-Nitrophenol	SVOA	93	U	93	92	U	92	93	U	93	97	U	97	92	U	92
Acenaphthene	SVOA	9.9	U	9.9	9.7	U	9.7	9.9	U	9.9	10	U	10	9.8	U	9.8
Acenaphthylene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	25	U	25	25	U	25	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	15	U	15	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	38	U	38	38	U	38	38	U	38	40	U	40	38	U	38
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	22	U	22
Bis(2-chloroethyl) ethe	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	44	U	44	44	U	44	46	U	46	44	U	44
Butylbenzylphthalate	SVOA	41	U	41	41	U	41	41	U	41	43	U	43	41	U	41
Carbazole	SVOA	35	U	35	34	U	34	34	U	34	36	U	36	34	U	34
Chrysene	SVOA	26	U	26	26	U	26	26	U	26	27	U	27	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	18	U	18	19	U	19	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	19	U	19	20	U	20	19	U	19
Diethyl phthalate	SVOA	25	U	25	25	U	25	25	U	25	26	U	26	25	U	25
Dimethyl phthalate	SVOA	22	U	22	22	U	22	22	U	22	23	U	23	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	34	U	34	34	U	34	36	U	36	34	U	34
Fluorene	SVOA	17	U	17	17	U	17	17	U	17	18	U	18	17	U	17
Hexachlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	28	U	28
Hexachlorobutadiene	SVOA	9.6	U	9.6	9.5	U	9.5	9.6	U	9.6	10	U	10	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	48	U	48	47	U	47	48	U	48	50	U	50	48	U	48
Hexachloroethane	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	21	U	21
Isophorone	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Naphthalene	SVOA	30	U	30	29	U	29	30	U	30	31	U	31	29	U	29
Nitrobenzene	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	29	U	29	30	U	30	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	20	U	20	21	U	21	20	U	20
Pentachlorophenol	SVOA	320	U	320	310	U	310	320	U	320	330	U	330	310	U	310
Phenanthrene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Phenol	SVOA	17	U	17	17	U	17	17	U	17	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	11 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-2 - J1TW62			SPA-3 - J1TW63			SPA-4 - J1TW64			SPA-5 - J1TW65			SPA-6 - J1TW66		
		7/29/14			7/29/14			7/29/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28	26	U	26
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	20	U	20
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
2,4,6-Trichlorophenol	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
2,4-Dichlorophenol	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
2,4-Dimethylphenol	SVOA	64	U	64	63	U	63	65	U	65	66	U	66	61	U	61
2,4-Dinitrophenol	SVOA	320	U	320	320	U	320	330	U	330	330	U	330	310	U	310
2,4-Dinitrotoluene	SVOA	64	U	64	63	U	63	65	U	65	66	U	66	61	U	61
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28	26	U	26
2-Chloronaphthalene	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
2-Chlorophenol	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	19	U	19
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	12	U	12	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	48	U	48	48	U	48	49	U	49	50	U	50	46	U	46
2-Nitrophenol	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
3,3'-Dichlorobenzidine	SVOA	87	U	87	86	U	86	89	U	89	89	U	89	83	U	83
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	31	U	31	33	U	33	33	U	33	30	U	30
3-Nitroaniline	SVOA	71	U	71	69	U	69	72	U	72	73	U	73	67	U	67
4,6-Dinitro-2-methylpheno	SVOA	320	U	320	310	U	310	330	U	330	330	U	330	300	U	300
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	18	U	18
4-Chloro-3-methylpheno	SVOA	64	U	64	63	U	63	65	U	65	66	U	66	61	U	61
4-Chloroaniline	SVOA	79	U	79	78	U	78	81	U	81	81	U	81	76	U	76
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	19	U	19
4-Nitroaniline	SVOA	70	U	70	69	U	69	72	U	72	72	U	72	67	U	67
4-Nitrophenol	SVOA	94	U	94	92	U	92	96	U	96	96	U	96	90	U	90
Acenaphthene	SVOA	10	U	10	9.8	U	9.8	10	U	10	10	U	10	9.5	U	9.5
Acenaphthylene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	20	U	20	20	U	20	18	U	18
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	20	U	20	20	U	20	18	U	18
Benzo(b)fluoranthene	SVOA	25	U	25	25	U	25	26	U	26	26	U	26	24	U	24
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	39	U	39	38	U	38	40	U	40	40	U	40	37	U	37
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	21	U	21
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	21	U	21
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	15	U	15
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	44	U	44	46	U	46	46	U	46	42	U	42
Butylbenzylphthalate	SVOA	42	U	42	41	U	41	43	U	43	43	U	43	40	U	40
Carbazole	SVOA	35	U	35	34	U	34	36	U	36	36	U	36	33	U	33
Chrysene	SVOA	26	U	26	26	U	26	27	U	27	27	U	27	25	U	25
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	20	U	20	20	U	20	18	U	18
Diethyl phthalate	SVOA	25	U	25	25	U	25	26	U	26	26	U	26	24	U	24
Dimethyl phthalate	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	21	U	21
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	29	U	29	29	U	29	27	U	27
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	13	U	13
Fluoranthene	SVOA	35	U	35	34	U	34	36	U	36	36	U	36	33	U	33
Fluorene	SVOA	17	U	17	17	U	17	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	28	U	28	28	U	28	29	U	29	29	U	29	27	U	27
Hexachlorobutadiene	SVOA	9.7	U	9.7	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.2	U	9.2
Hexachlorocyclopentadiene	SVOA	48	U	48	48	U	48	49	U	49	50	U	50	46	U	46
Hexachloroethane	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	20	U	20
Isophorone	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	16	U	16
Naphthalene	SVOA	30	U	30	29	U	29	31	U	31	31	U	31	29	U	29
Nitrobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	20	U	20
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	29	U	29	31	U	31	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	19	U	19
Pentachlorophenol	SVOA	320	U	320	310	U	310	330	U	330	330	U	330	300	U	300
Phenanthrene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	16	U	16
Phenol	SVOA	17	U	17	17	U	17	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11

Attachment	1	Sheet No.	12 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-7 - J1TW67			SPA-8 - J1TW68			SPA-9 - J1TW69			SPA-10 - J1TW70			SPA-11 - J1TW71		
		7/29/14			7/29/14			7/29/14			7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	26	U	26	27	U	27	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	11	U	11	11	U	11	12	U	12	11	U	11	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
2,4-Dimethylphenol	SVOA	63	U	63	61	U	61	64	U	64	63	U	63	63	U	63
2,4-Dinitrophenol	SVOA	320	U	320	310	U	310	320	U	320	320	U	320	320	U	320
2,4-Dinitrotoluene	SVOA	63	U	63	61	U	61	64	U	64	63	U	63	63	U	63
2,6-Dinitrotoluene	SVOA	27	U	27	26	U	26	27	U	27	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	13	U	13	12	U	12	12	U	12
2-Nitroaniline	SVOA	48	U	48	47	U	47	48	U	48	48	U	48	48	U	48
2-Nitrophenol	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	86	U	86	84	U	84	87	U	87	86	U	86	86	U	86
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	31	U	31	32	U	32	32	U	32	31	U	31
3-Nitroaniline	SVOA	69	U	69	68	U	68	71	U	71	70	U	70	70	U	70
4,6-Dinitro-2-methylpheno	SVOA	310	U	310	310	U	310	320	U	320	320	U	320	310	U	310
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
4-Chloro-3-methylpheno	SVOA	63	U	63	61	U	61	64	U	64	63	U	63	63	U	63
4-Chloroaniline	SVOA	78	U	78	76	U	76	79	U	79	78	U	78	78	U	78
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
4-Nitroaniline	SVOA	69	U	69	68	U	68	70	U	70	69	U	69	69	U	69
4-Nitrophenol	SVOA	92	U	92	90	U	90	94	U	94	93	U	93	92	U	92
Acenaphthene	SVOA	9.8	U	9.8	9.6	U	9.6	10	U	10	9.9	U	9.9	9.8	U	9.8
Acenaphthylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	24	U	24	25	U	25	25	U	25	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
Benzo(k)fluoranthene	SVOA	38	U	38	37	U	37	39	U	39	38	U	38	38	U	38
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	15	U	15	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	43	U	43	44	U	44	44	U	44	44	U	44
Butylbenzylphthalate	SVOA	41	U	41	40	U	40	42	U	42	41	U	41	41	U	41
Carbazole	SVOA	34	U	34	34	U	34	35	U	35	34	U	34	34	U	34
Chrysene	SVOA	26	U	26	25	U	25	26	U	26	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
Diethyl phthalate	SVOA	25	U	25	24	U	24	25	U	25	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	13	U	13	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	34	U	34	34	U	34	35	U	35	34	U	34	34	U	34
Fluorene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Hexachlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	9.5	U	9.5	9.3	U	9.3	9.7	U	9.7	9.6	U	9.6	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	48	U	48	47	U	47	48	U	48	48	U	48	48	U	48
Hexachloroethane	SVOA	20	U	20	20	U	20	21	U	21	20	U	20	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
Isophorone	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Naphthalene	SVOA	30	U	30	29	U	29	30	U	30	30	U	30	30	U	30
Nitrobenzene	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	29	U	29	30	U	30	30	U	30	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Pentachlorophenol	SVOA	310	U	310	310	U	310	320	U	320	320	U	320	310	U	310
Phenanthrene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Phenol	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Pyrene	SVOA	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	13 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Attachment 1. 1607-D2:5 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-12 - J1TW72			Equipment Blank - J1TW74		
		7/29/14			7/29/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	67	U	67	66	U	66
2,4-Dinitrophenol	SVOA	340	U	340	330	U	330
2,4-Dinitrotoluene	SVOA	67	U	67	66	U	66
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13
2-Nitroaniline	SVOA	51	U	51	50	U	50
2-Nitrophenol	SVOA	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	92	U	92	90	U	90
3+4 Methylphenol (cresol, m+p)	SVOA	34	U	34	33	U	33
3-Nitroaniline	SVOA	74	U	74	73	U	73
4,6-Dinitro-2-methylpheno	SVOA	340	U	340	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19
4-Chloro-3-methylpheno	SVOA	67	U	67	66	U	66
4-Chloroaniline	SVOA	83	U	83	82	U	82
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21
4-Nitroaniline	SVOA	74	U	74	73	U	73
4-Nitrophenol	SVOA	99	U	99	97	U	97
Acenaphthene	SVOA	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	17	U	17
Anthracene	SVOA	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	27	U	27	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	41	U	41	40	U	40
Bis(2-chloro-1-methylethyl)ethe	SVOA	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	47	U	47	46	U	46
Butylbenzylphthalate	SVOA	44	U	44	43	U	43
Carbazole	SVOA	37	U	37	36	U	36
Chrysene	SVOA	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20
Diethyl phthalate	SVOA	26	U	26	26	U	26
Dimethyl phthalate	SVOA	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	15	U	15	14	U	14
Fluoranthene	SVOA	37	U	37	36	U	36
Fluorene	SVOA	18	U	18	18	U	18
Hexachlorobenzene	SVOA	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	51	U	51	50	U	50
Hexachloroethane	SVOA	22	U	22	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17
Naphthalene	SVOA	32	U	32	31	U	31
Nitrobenzene	SVOA	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	32	U	32	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21
Pentachlorophenol	SVOA	340	U	340	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17
Phenol	SVOA	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	12	U	12

Attachment	1	Sheet No.	14 of 14
Originator	J. D. Skoglie	Date	9/11/14
Checked	I. B. Berezovskiy	Date	9/11/14
Calc. No.	0100D-CA-V0549	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0550

Subject: 1607-D2:5 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

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 Sheets = 3 Total = 4	J. D. Skoglie	I. B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	10/27/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/18/2014	Calc. No.:	0100D-CA-V0550	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/18/2014
Subject:	1607-D2:5 Subsite 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 1607-D2:5 subsite. 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.

GIVEN/REFERENCES:

1) 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.

2) 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.

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

4) WCH, 2014, *1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations*, Calculation Number 0100D-CA-V0549, Washington Closure Hanford, 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 CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/16/2014	Calc. No.:	0100D-CA-V0550	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/16/2014
Subject:	1607-D2:5 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	2 of 3

METHODOLOGY:

The 1607-D2:5 subsite underwent statistical sampling at 2 decision units for verification sampling; the excavation area and staging pile area. The direct contact hazard quotient and carcinogenic risk calculations for the 1607-D2:5 subsite were conservatively calculated for the entire data set using the greater of the maximum and the statistical verification soil sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, molybdenum, and the detected polycyclic aromatic hydrocarbons (PAHs) require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Selenium and fluoride were included because these constituents were detected above a Washington State or Hanford Site background. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 2.1 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 2.9×10^{-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. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 6.0×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the statistical value for hexavalent chromium is 0.327 mg/kg, divided by 2.1 mg/kg, and multiplied as indicated, is 1.6×10^{-7}. 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 excess cancer risk for these is 2.3×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/16/2014	Calc. No.:	0100D-CA-V0550	Rev.:	0
Project:	100-D Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/16/2014
Subject:	1607-D2:5 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	3 of 3

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 1607-D2:5 Subsite.

Contaminants of Potential Concern	Maximum or Statistical Value [a] (mg/kg)	Noncarcinogen RAG [b] (mg/kg)	Hazard Quotient	Carcinogen RAG [b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.1	7200	2.9E-04	--	--
Chromium, hexavalent [c]	0.327	240	1.4E-03	2.1	1.6E-07
Molybdenum	0.53	400	1.3E-03	--	--
Selenium	0.89	400	2.2E-03	--	--
Anions					
Fluoride	4.0	4,800	8.3E-04	--	--
Polyaromatic Hydrocarbons					
Benzo(a)anthracene	0.0055	--	--	1.37	4.0E-09
Benzo(a)pyrene	0.0086	--	--	0.137	6.3E-08
Benzo(b)fluoranthene	0.011	--	--	1.37	8.0E-09
Chrysene	0.0062	--	--	13.7	4.5E-10
Totals					
Cumulative Hazard Quotient:			**6.0E-03**		
Cumulative Excess Cancer Risk:					**2.3E-07**

Notes:

[a] = From WCH (2014).

[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] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.

-- = not applicable

RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrate that the 1607-D2:5 subsite area meets the requirements for the direct contact hazard quotient and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009b) and SAP (DOE-RL 2009a). The direct contact hazard quotient and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0551

Subject: 1607-D2:5 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater

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 Total = 4	J. D. Skoglie	I. B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	10/27/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/18/2014	Calc. No.:	0100D-CA-V0551	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/18/2014
Subject:	1607-D2:5 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 1607-D2:5 subsite. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), 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 $\leq 1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $\leq 1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) BHI, 2005, *100 Area Analogous Sites RESRAD Evaluation*, Calculation No. 0100X-CA-V0050 Rev 0, Bechtel Hanford, Inc., Richland, Washington.

2) DOE-RL, 2009, *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, 2014, *1607-D2:5 Subsite Cleanup Verification 95% UCL Calculations*, Calculation Number 0100D-CA-V0549, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Generate a HQ for each noncarcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (BHI 2005).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (BHI 2005).

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/16/2014	Calc. No.:	0100D-CA-V0551	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/16/2014
Subject:	1607-D2:5 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No.	2 of 3

METHODOLOGY:

The 1607-D2:5 subsite underwent statistical sampling at two decision units for verification sampling; the excavation area and the staging pile area. One duplicate sample was collected. The protection of groundwater hazard quotient and carcinogenic risk calculations for the 1607-D2:5 subsite were conservatively calculated for the entire waste site using the greatest of the maximum soil sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site boron and hexavalent chromium required an HQ and risk calculation because these analytes were detected and a Washington State or Hanford Site background value is not available, and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (BHI 2005). Selenium was included because this analyte was detected above a Hanford Site or Washington State background value and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years. Based on this model and a vadose zone of approximately 13.5 m (45 ft) thickness, a K_d of 5.6 or greater is required to show no predicted migration to groundwater in 1,000 years. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 5.6. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (mg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720(3)(a)(ii)(A), 1996) x 100 x 1 mg/1000 mg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the maximum value for boron of 2.1 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 6.6×10^{-3}. Comparing this value 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. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The cumulative HQ for the 1607-D2:5 subsite is 1.9×10^{-1}. 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 and multiplied by 1×10^{-6}. For this site, there were not any constituents detected above background and/or above a Kd value of 5.6 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-6}$ 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. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. For this site, there were not any constituents detected above background and/or above a Kd value of 5.6 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-5}$ is met.

5) The soil cleanup RAGs for protection of groundwater are based on the "100 times" provision in WAC 173-340-740(3)(a)(ii)(A). WAC 173-340-740(3)(a)(ii)(A) (1996) provides the "100 times

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	9/18/2014	Calc. No.:	0100D-CA-V0551	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	9/18/2014
Subject:	1607-D2:5 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No.	3 of 3

rule" but also states "unless it can be demonstrated that a higher soil concentration is protective of ground water at the site." When the "100 times rule" values are exceeded, RESRAD was used to demonstrate that higher soil concentrations may be protective of groundwater.

RESULTS:

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

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 1607-D2:5 Subsite.

Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.1	320	6.6E-03	--	--
Chromium, hexavalent	0.327	4.8	6.8E-02	--	--
Selenium	0.89	8	1.1E-01	--	--
Totals					
Cumulative Hazard Quotient:			**1.9E-01**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:
[a] = From WCH (2014).
[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.
-- = not applicable
RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 1607-D2:5 subsite meets the requirements for the hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009).

APPENDIX C

DATA QUALITY ASSESSMENT

APPENDIX C

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 site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2009).

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

To ensure quality data, the 100 Area SAP (DOE-RL 2009) data assurance requirements and the data validation procedures 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 1607-D2:5 subsite were provided by the laboratories in two sample delivery groups (SDG): SDG JP0819 and SDG JP0842. SDG JP0819 was submitted for third-party validation. Major and minor deficiencies are discussed for the 1607-D2:5 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.

MAJOR DEFICIENCIES

Due to holding time exceedances in the method 300.0 IC anions analysis of greater than twice the limit of 48 hours, third-party validation qualified the associated undetected nitrite and orthophosphate results in SDG JP0819 as rejected with "R" flags. Additionally, all of the detected method 9056M nitrate and orthophosphate results are qualified as estimated with "J" flags. This result was anticipated, and U.S. Environmental Protection Agency analytical method 353.2 was also requested to provide acceptable nitrate/nitrite data for decision making purposes. Therefore, the estimated and rejected data for nitrate and nitrite do not hinder the evaluation of the 1607-D2:5 subsite. Phosphate is not a regulated chemical under *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act-Cleanup."

MINOR DEFICIENCIES

SDG JP0819

This SDG comprises 12 statistical soil samples (J1TW48 through J1TW59) from the excavation area. This SDG includes one field duplicate pair (J1TW48/J1TW60). All samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, ion chromatography (IC) anions, nitrate/nitrite, semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCBs). SDG JP0819 was submitted for third-party validation. Minor deficiencies are as follows.

In the ICP metals analysis, the matrix spike (MS) recoveries were outside the project acceptance criteria for five analytes (aluminum [1,426%], antimony [46%], iron [2,509%], manganese [152%], and silicon [-1%]). For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration rather than a measure of the recovery from the sample. Antimony and silicon did not have a mismatched spike and native concentrations in the MS. All antimony and silicon results for SDG JP0819 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP analysis, the laboratory control sample (LCS) recovery for silicon is below the laboratory recovery limits at 9%. All silicon results in SDG JP0819 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by more than twice the specified holding time for nitrate, nitrite, and orthophosphate. The nondetected results for these analytes are discussed above in the Major Deficiencies section and were qualified as rejected by third-party validation. Nitrite results were undetected in all field samples. Orthophosphate results were undetected in samples J1TW48 through J1TW50, J1TW53, and J1TW56 through J1TW60. All detected nitrate and orthophosphate results were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the MS recoveries for fluoride (46% and 62%), sulfate (64% and 67%), and orthophosphate (52% and 64%) were outside the project acceptance criteria. All fluoride, sulfate, and orthophosphate results were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the hexavalent chromium analysis, the MS recovery was outside the project quality control (QC) criteria. All hexavalent chromium results were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS and matrix spike duplicate recoveries were outside the QC limits for 2,4-dinitrophenol (20% and 21%). Third-party validation qualified all 2,4-dinitrophenol results as estimated with "J" flags. Laboratory control sample recovery for 2,4-dinitrophenol was within acceptable QC limits. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the LCS recovery was outside the QC limits for 4-chloroanaline (42%). All 4-chloroanaline results in samples J1TW50, J1TW51, J1TW53, J1TW56, J1TW57, J1TW58, and J1TW60, were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS recovery was below the project acceptance criteria for 4-chloroanaline (47%). Third-party validation qualified all 4-chloroanaline results in samples J1TW50, J1TW51, J1TW53, J1TW56, J1TW57, J1TW58, and J1TW60 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0842

This SDG comprises 12 statistical soil samples (J1TW61 through J1TW72) from the staging pile area. This SDG includes one field duplicate pair (J1TW61/J1TW73). All samples were analyzed for ICP metals, mercury, hexavalent chromium, IC anions, nitrate/nitrite, SVOCs, PAHs, and PCBs. In addition, one field equipment blank sample (J1TW74) was collected and analyzed for ICP metals, mercury, and SVOCs. Minor deficiencies are as follows.

In the ICP metals analysis, nickel and zinc were detected in the method blank at very low levels, less than 1/25th of the associated field sample result. Although not qualified for the method blank contamination, all nickel and zinc results may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon was below the project recovery limit at 13%. Silicon is not a contaminants of potential concern for the 1607-D2:5 waste site, nor is it a regulated compound under the WAC 173-340, "Model Toxics Control Act-Cleanup." Although not qualified for LCS recovery outside the QC limits, all silicon results in SDG JP0842 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries are out of project acceptance criteria for five analytes (aluminum [1,299%], antimony [46%], iron [-124%], manganese [55%], and silicon [2%]. For aluminum, iron, and manganese analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentrations rather than a measure of the recovery from the sample. Antimony and silicon did not have mismatched spike and native concentrations in the MS. Although not qualified for MS results outside the QC limits, all antimony and silicon results for SDG JP0842 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate relative percent difference (RPD) for silicon is above the acceptance criteria of 30% at 38%. Elevated RPDs in environmental soil samples are generally attributed to natural heterogeneities in the sample matrix. Although not qualified for the RPD above the QC limits, all silicon data results in SDG JP0842 may be considered estimated. Estimated data are usable for decision-making purposes.

In the hexavalent chromium analysis, the MS recovery was outside the project QC criteria. Although not qualified for MS recovery outside the QC limits, all hexavalent chromium results in SDG JP0842 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by less than twice the specified holding time for nitrate, nitrite, and orthophosphate. Nitrite and orthophosphate results were undetected in all field samples. Nitrate was detected in all field samples. Although not qualified for holding time exceedance of less than twice the 48 hours holding time, all nitrate, nitrite, and orthophosphate results for SDG JP0842 may be considered estimated. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent difference 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 (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 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
Excavation Area	J1TW48	J1TW60
Staging Pile Area	J1TW61	J1TW73

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. 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.

None of the RPDs calculated for the field duplicate samples are above the acceptance criteria (30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control. 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, including undetected analytes. In these cases, a control limit of ±2 times the target detection limit is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. Chloride in the duplicate sample evaluation from the staging pile area decision unit 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 1607-D2:5 subsite 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 1607-D2:5 subsite 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.

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.

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

WCH, 2014a, *100-D Field Remediation and Sampling*, Logbook EL-1662-02, pp. 46-50, 74-77, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 1607-D2:5, Inlet Pipe to Replacement System Tile Field,* 0100D-WI-G0138, Rev. 0, Washington Closure Hanford, Richland, Washington.

Actionee: Connerly, Jenise

Comments:

Due Date: NO ACTION

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U.S. Department of Energy
Richland Operations Office
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Subject: Contract No. DE-AC06-05RL14655
TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 1607-D2:5, INLET PIPE TO REPLACEMENT SYSTEM TILE FIELD SUBSITE, REVISION 0

Dear Ms. Connerly:

Attached is the approved Waste Site Reclassification Form No. 2014-103 and supporting *Remaining Sites Verification Package for the 1607-D2:5, Inlet Pipe to Replacement System Tile Field Subsite,* Rev. 0, for your use and transmittal to the Washington State Department of Ecology.

If you have questions regarding this document, please contact me or call Ms. T. Q. Howell at 372-0162, or send an email to tqhowell@wch-rcc.com.

Sincerely,

R. D. Cantwell, Director
Closure Operations

TQH:djb

Attachments: Waste Site Reclassification Form No. 2014-103 and supporting *Remaining Sites Verification Package for the 1607-D2:5, Inlet Pipe to Replacement System Tile Field Subsite*, Rev. 0

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