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

11-AMRC-0124

APR 14 2011

Mr. D. A. Faulk, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Boulevard, Suite 115
Richland, Washington 99352

Dear Mr. Faulk:

TRANSMITTAL OF THE APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 600-188, WHITE BLUFFS WASTE DISPOSAL TRENCH 2, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2010-090 and supporting "Remaining Sites Verification Package for the 600-188, White Bluffs Waste Disposal Trench 2," Revision 0. If you have questions, please contact me or your staff may contact Jamie Zeisloft, of my staff, at (509) 372-0188.

Sincerely,

Mark S. French, Federal Project Director
for the River Corridor Closure Project

AMRC:JHZ

Attachment

cc w/attach:
C. J. Guzzetti, EPA
Administrative Record, H6-08

cc w/o attach:
S. L. Feaster, WCH
T. A. Foster, WCH
M. L. Proctor, WCH

Date Submitted: 2/9/2011 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-IU-2 Waste Site Code: 600-188 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2010-090

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed Out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:

The 600-188, White Bluffs Waste Disposal Trench 2 waste site was an open borrow pit approximately 2 to 3 m (3 to 6 ft) deep with industrial wastes scattered throughout the surface of the site. The waste site is believed to have been a borrow pit that received discarded construction and shop related debris. The 600-188 waste site is identified as a candidate site for confirmatory sampling in the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999). However, confirmatory sampling was determined to be unnecessary and the waste site was recommended for remediation because historical information, a site walkdown, and geophysical data indicated that 600-188 had received waste containing hazardous constituents.

Remedial action at the 600-188 waste site was performed in February 2010. The remediation resulted in approximately 2.5 m (8 ft) of material being removed at the deepest portion. This material was placed in staging piles adjacent to the waste site prior to being sent to the Environmental Restoration Disposal Facility.

Basis for reclassification:

Following remediation, verification sampling was conducted in September 2010. The sample results were evaluated in comparison to the remedial action goals (RAGs). The results demonstrate that residual contaminant concentrations meet direct exposure cleanup criteria and are protective of groundwater and the Columbia River.

In accordance with this evaluation, the verification sampling results support a reclassification of the 600-188 waste site to Interim Closed Out. The current site conditions achieve the RAGs established by the Remaining Sites ROD (EPA 1999). The results of verification sampling 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 analytical results and rationale presented in the attached remaining sites verification package also demonstrate that the 600-188 waste site is protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep-zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 600-188, White Bluffs Waste Disposal Trench 2* (attached).

Waste Site Controls:

Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

M. S. French DOE Federal Project Director (printed)	M S French Signature	3/12/11 Date
N/A Ecology Project Manager (printed)	Signature	Date
L Buelow for C. Guzzetti EPA Project Manager (printed)	Signature	3/16/11 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-188, WHITE BLUFFS WASTE DISPOSAL TRENCH 2

Attachment to Waste Site Reclassification Form 2010-090

March 2011

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-188, WHITE BLUFFS WASTE DISPOSAL TRENCH 2

EXECUTIVE SUMMARY

The 600-188, White Bluffs Waste Disposal Trench 2 waste site, located in the 100-IU-2 Operable Unit, was an open borrow pit approximately 2 to 3 m (3 to 6 ft) deep, with industrial wastes scattered throughout the surface of the site. The waste site is believed to have been a borrow pit that received discarded construction and shop related debris.

It was estimated that the borrow pit was approximately 90 by 40 m (300 by 130 ft) in length and width. Discolored soils, empty drums, railroad ties, fencing, and evidence of chemical or oil dumping and burning were observed at the waste site. The west side of the site appeared to have been previously disturbed, with mature sagebrush currently growing in the area. The south portion of the site contained mature sagebrush and cheatgrass, and a metal tank, as well as large pieces of metal debris and railroad ties. Also in the south portion of the site were multiple areas with a lack of vegetation, which ranged up to 1 m (3 ft) in diameter. In the southeast corner of the site was an open, grassy area surrounded by mature sagebrush. A low berm ran across the clearing, where some debris and cans were present. The waste site was located approximately 1,000 m (3,280 ft) southeast of the intersection of Route 2 North and Federal Avenue.

Remedial action at the 600-188 waste site was performed in February 2010. Debris and soil to a depth no more than 1 m (3 ft) below the existing borrow pit surface was removed from the waste site. The excavation surface was 2.5 m (8 ft) below grade at the deepest area.

Following remediation, verification sampling was conducted in September 2010. The results indicated that the waste removal action achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) for the 600-188 waste site. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 600-188 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007).

Table ES-1. Summary of Remedial Action Goals for the 600-188 Waste Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Radionuclides were not COPCs for the 600-188 waste site.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COC and COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COCs/COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (1.8×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Excess cancer risk values for individual nonradionuclide COCs/COPCs are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess carcinogenic risk for all sampling areas (6.6×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COC groundwater and river RAGs.	Radionuclides were not COPCs for the 600-188 waste site.	Yes
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].		
	Meet total uranium standard of 21.2 pCi/L [c].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene are present at concentrations slightly above soil RAGs for groundwater and/or Columbia River protection. However, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of these constituents are not expected to migrate vertically in 1,000 years, based on the soil-partitioning coefficient (K_d) of 360 mL/g for benzo(a)anthracene, the constituent with the lowest K_d The vadose zone underlying the 600-188 waste site excavation is approximately 8.8 m (28.8 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the river.	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).

COC = contaminant of concern
COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the RAOs and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of concern, contaminants of potential concern, and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* Chapter 173-340, Table 749-3 were boron and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, manganese, vanadium, and zinc. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. Because the detected levels of antimony, manganese, vanadium, and zinc are below Hanford Site background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. No established background value is available for boron; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-188, WHITE BLUFFS WASTE DISPOSAL TRENCH 2

STATEMENT OF PROTECTIVENESS

The 600-188, White Bluffs Waste Disposal Trench 2 waste site 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* (RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of concern, contaminants of potential concern, and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* Chapter 173-340, Table 749-3 were boron and vanadium. U.S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, manganese, vanadium, and zinc. No established background value is available for boron; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. The detected levels of antimony, manganese, vanadium, and zinc are below Hanford Site background levels are therefore not expected to pose a risk to ecological receptors. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

GENERAL SITE INFORMATION AND BACKGROUND

The 600-188, White Bluffs Waste Disposal Trench 2 waste site, located in the 100-IU-2 Operable Unit, was an open borrow pit approximately 2 to 3 m (3 to 6 ft) deep, with industrial wastes scattered throughout the surface of the site. The waste site is believed to have been a borrow pit that received discarded construction and shop related debris.

It was estimated that the borrow pit was approximately 90 by 40 m (300 by 130 ft) in length and width. Discolored soils, empty drums, railroad ties, fencing, and evidence of chemical or oil

dumping and burning were observed at the waste site. The west side of the site appeared to have been previously disturbed, with mature sagebrush currently growing in the area. The south portion of the site contained mature sagebrush and cheatgrass, and a metal tank, as well as large pieces of metal debris and railroad ties. Also in the south portion of the site were multiple areas with a lack of vegetation, which ranged up to 1 m (3 ft) in diameter. In the southeast corner of the site was an open, grassy area surrounded by mature sagebrush. A low berm ran across the clearing, where some debris and cans were present. The waste site was located approximately 1,000 m (3,280 ft) southeast of the intersection of Route 2 North and Federal Avenue (Figure 1).

Geophysical Survey

In 2004, a geophysical survey was performed on the 600-188 waste site and surrounding area (BHI 2004). Scattered surface debris was found throughout the area, with the heaviest concentration near the edges of the open pit. No buried debris was indicated by the geophysical survey. Two magnetic zones indicative of basalt-rich gravel used for road bedding were also observed in the geophysical survey (Figure 2).

Site Walkdown

In April 1999, an initial site walkdown was performed, at which time three empty 208-L (55-gal) drums were observed. The drums were located near the eastern edge of the waste site. One drum appeared to have bulged, indicating possible combustion of the contents.

On February 5, 2004, a second site walkdown was performed. Surface debris consistent with a borrow pit was observed at this time and confirmatory sampling was deemed unnecessary based upon the historical site information, geophysical data, and field observations.

REMEDIAL ACTION SUMMARY

The 600-188 waste site is identified as a candidate site for confirmatory sampling in the Remaining Sites ROD (EPA 1999). However, based on historical information, a site walkdown, and geophysical data, confirmatory sampling was determined to be unnecessary, and the waste site was recommended for remove, treat, and dispose (WCH 2004).

On December 14, 2009, two waste characterization samples were collected from the 600-188 waste site to support preparation of the waste disposal profile. Sample J19CV7 was a focused soil sample collected from Washington State Plane coordinates N 147017, E 578348, located within an area with evidence of past burning and some distressed vegetation. Sample J19CV8 was collected from random aliquots of soil distributed across the surface of the waste site and then combined into one sample for laboratory analysis. The sample results are provided in Appendix A. No contaminant concentrations exceeded direct exposure RAGs. Several metals exceeded soil cleanup levels for protection of groundwater and/or the Columbia River but no organic chemicals exceeded soil RAGs.

Figure 1. The 600-188 Waste Site Location Map.

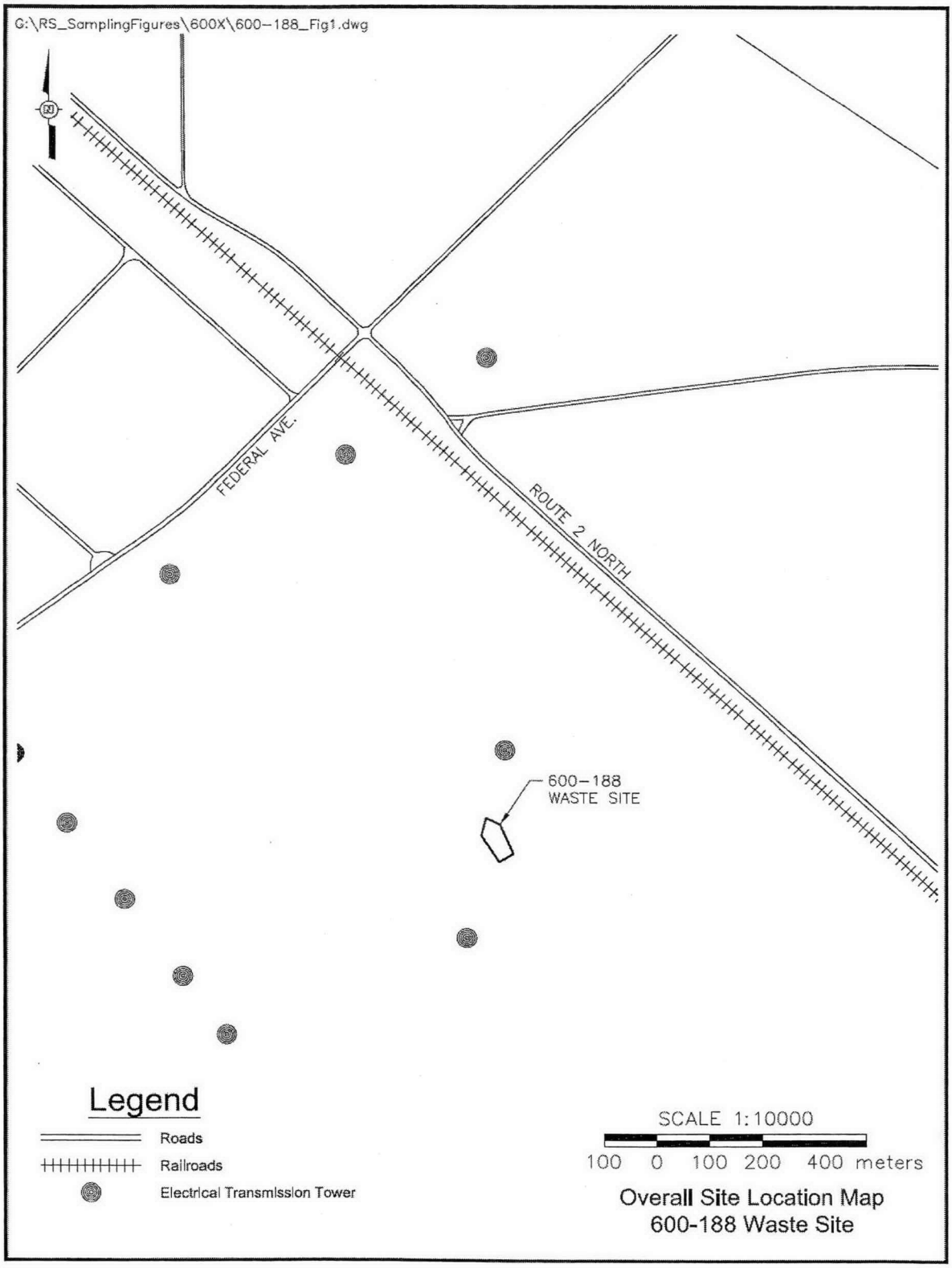
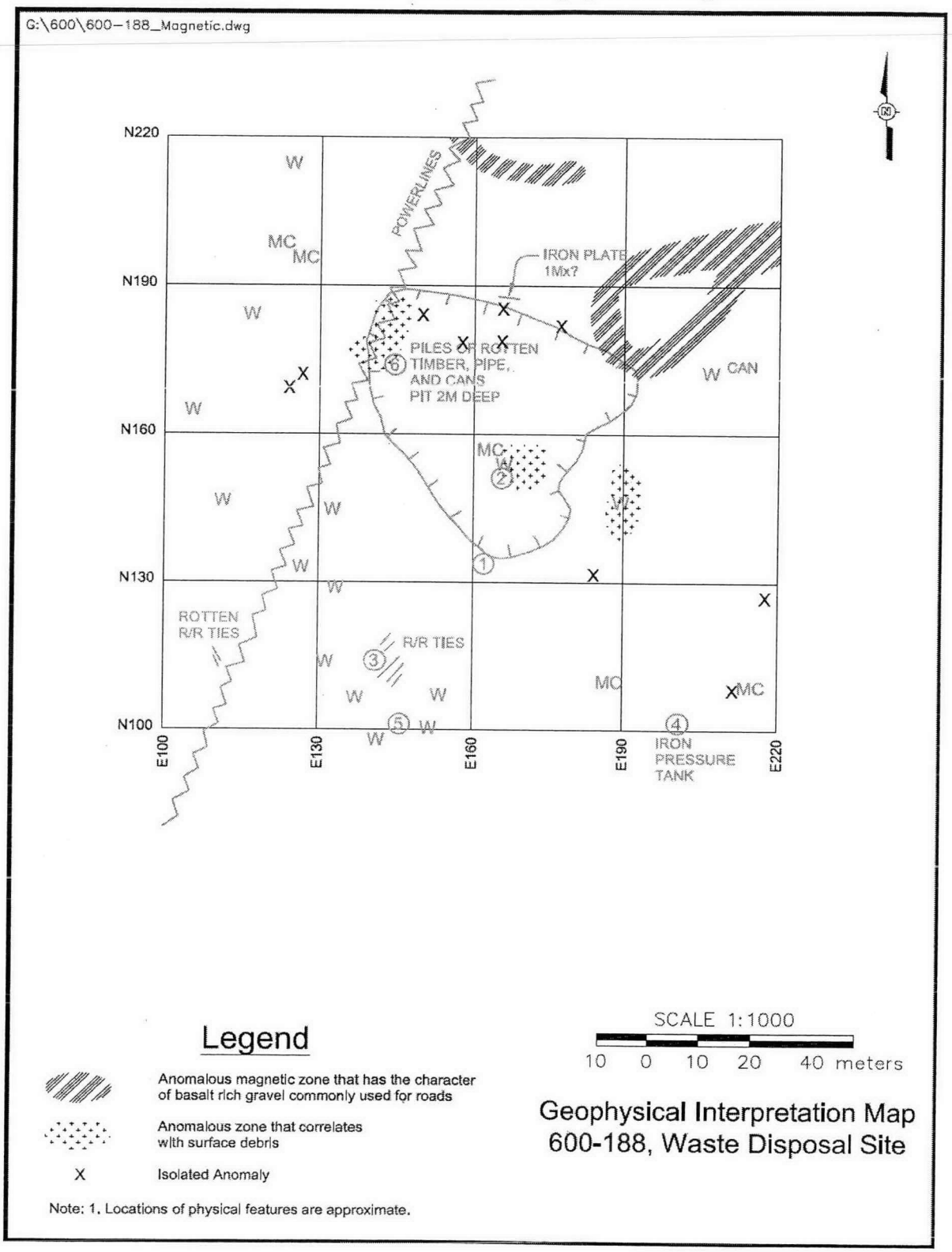


Figure 2. The 600-188 Waste Site Geophysical Interpretation.



Remedial Action

The 600-188 waste site was remediated on February 10 and 11, 2010. Debris and soil to a depth no more than 1 m (3 ft) below the existing borrow pit surface were removed from the waste site. The excavation surface was 2.5 m (8 ft) below grade at the deepest area. Material removed from the perimeter around the excavation was placed into an overburden pile to be used as backfill material. Waste material was placed in a staging pile area, which was then loaded out to the Environmental Restoration Disposal Facility.

On March 3, 2010, three in-process soil samples (J19L34, J19L35, and J19L36), one duplicate sample (J19L37), and one equipment blank (J19L38) were collected to evaluate the adequacy of remediation. The footprint of the excavation was divided into three sample areas, and a sample was collected from multiple aliquots of soil across the top of each area (Appendix A). No contaminant concentrations of in-process soil samples exceeded direct exposure RAGs. Concentrations of several metals exceeded soil cleanup levels for protection of groundwater and/or the Columbia River but no organic chemicals exceeded soil RAGs.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 600-188 waste site was conducted in September 2010 to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). The verification sample results are provided in Appendix B and indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) for the 600-188 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. A more detailed discussion of the verification sampling can be found in the *Work Instruction for Verification Sampling of the 600-188, White Bluffs Waste Disposal Trench 2* (WCH 2010).

Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 600-188 waste site were identified in the RDR/RAWP (DOE-RL 2009b) as polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), asbestos, barium, cadmium, chromium (total), mercury, lead, selenium, hexavalent chromium, and sulfate. Field observations during remediation, waste characterization sampling results, and in-process sampling results (Appendix A) were then used to refine the list of COPCs for verification sampling.

Asbestos-containing material was not encountered during remedial activities; therefore, asbestos was eliminated as a COPC. Pesticides and naphthalene, a SVOC, were detected in waste characterization samples; however, both were co-located with the polycyclic aromatic hydrocarbons (PAH). Because of the co-location, and because pesticides and SVOCs were not detected during in-process sampling after remediation, both were eliminated as COPCs. Polychlorinated biphenyls were not detected in the waste characterization samples and were

eliminated as COPCs. Hexavalent chromium was not detected in the in-process samples and was also eliminated as a COPC. Waste characterization and in-process samples were not analyzed for sulfate; however, process-knowledge indicates that this constituent is not of concern because the soil cleanup criteria for protection of groundwater is 25,000 mg/kg (DOE-RL 2009b).

Volatile organic compounds (VOCs), PAH, and TPH were detected during in-process sampling and were therefore included as COPCs. Cadmium, copper, lead, mercury, and zinc were detected during in-process sampling and were also included as COPCs.

Although not considered COPCs, analyses for the constituents of the inductively coupled plasma (ICP) metals list included antimony, arsenic, barium, beryllium, boron, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, and vanadium.

A summary of all the contaminants analyzed is provided in Table 1.

Table 1. 600-188 Laboratory Analytical Methods.

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Cadmium, copper, lead, zinc
Mercury – EPA Method 7471	Mercury
PAH – EPA Method 8310	PAH
TPH – NWTPH-Dx [b]	TPH
VOA – EPA Method 8260	VOCs

[a] Analyses was performed for the expanded list of ICP metals including antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] NWTPH-Dx analyzes for both diesel and heavy oil range organics.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
NWTPH-Dx = Northwest total petroleum hydrocarbons – diesel range organics
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis
VOC = volatile organic compound

Verification Sample Design

This section describes the basis for selection of an appropriate sample design and determination of the number of verification samples that were collected. All sampling was performed in accordance with the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2009a). Professional knowledge and the laboratory results of waste characterization and in-process sampling were used to develop the verification sampling design for the 600-188 waste site. A statistical sampling design was used to collect samples from the excavation at the coordinates provided in Table 2. A composite sampling design was used to collect samples from the staging pile area and overburden footprints. Figure 3 shows the waste site footprint and the sampling locations.

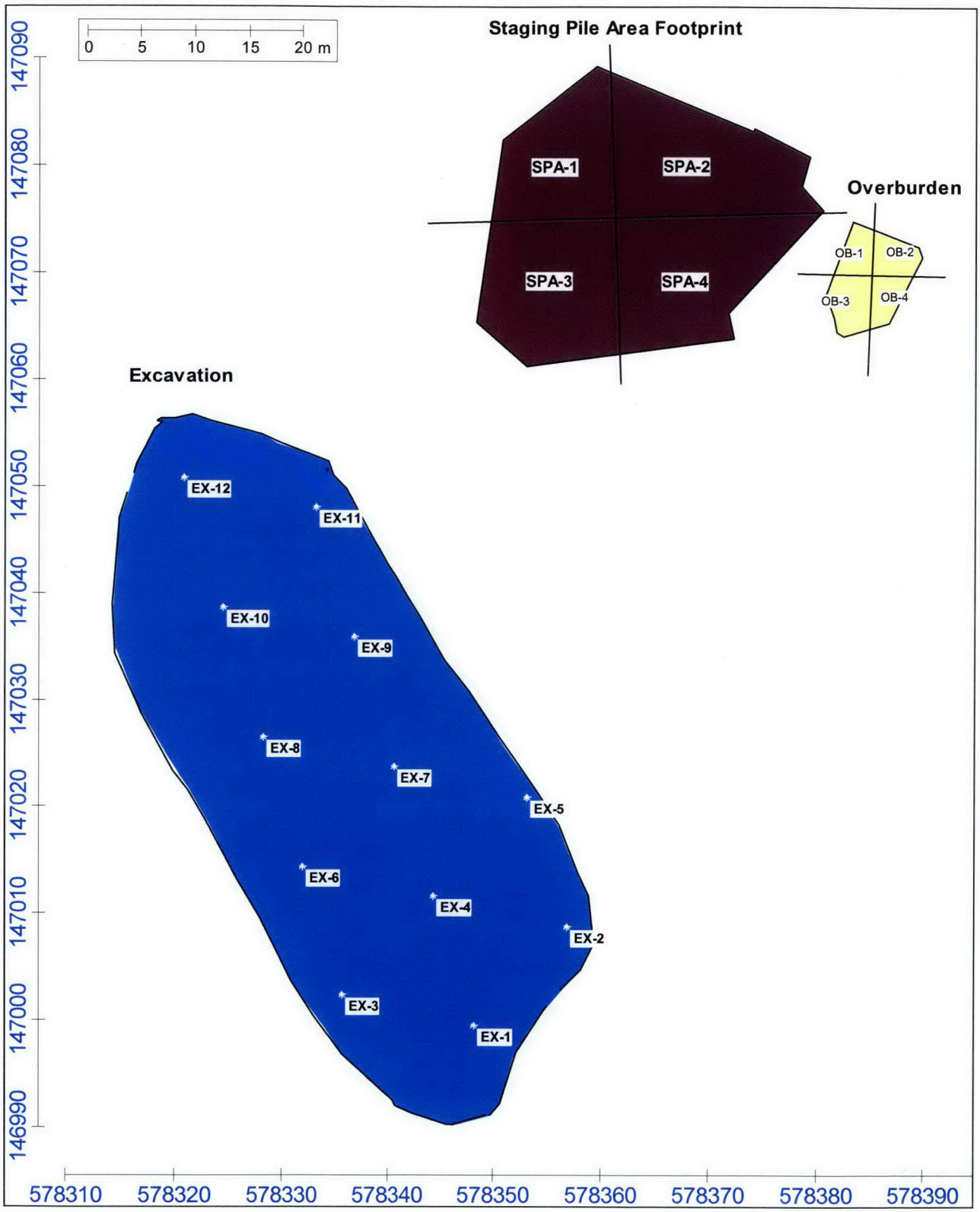
Table 2. 600-188 Verification Sampling Summary Table.

Sample Location	HEIS Number	WSP Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
EX-1	J1B8W6	146999.5	578348.2	ICP metals [a], mercury, PAH, TPH, VOA
EX-2	J1B8X0	147008.8	578356.8	
EX-3	J1B8W8	147002.4	578335.8	
EX-4	J1B8W9	147011.7	578344.5	
EX-5	J1B8W7	147021.0	578353.1	
EX-6	J1B8X1	147014.5	578332.1	
EX-7	J1B8X2	147023.8	578340.7	
EX-8	J1B8X3	147026.6	578328.3	
EX-9	J1B8X4	147035.9	578337.0	
EX-10	J1B8X5	147038.7	578324.6	
EX-11	J1B8X6	147048.0	578333.2	
EX-12	J1B8X7	147050.9	578320.9	
Duplicate of EX-5	J1B8Y2	147021.0	578353.1	
SPA-1 (NW quad.)	J1B8X8	NA	NA	
SPA-2 (NE quad.)	J1B8X9	NA	NA	
SPA-3 (SW quad.)	J1B8Y0	NA	NA	
SPA-4 (SE quad.)	J1B8Y1	NA	NA	
Duplicate of SPA-1	J1B8Y3	NA	NA	
OB-1 (NW quad.)	J1B8Y4	NA	NA	
OB-2 (NE quad.)	J1B8Y5	NA	NA	
OB-3 (SW quad.)	J1B8Y6	NA	NA	
OB-4 (SE quad.)	J1B8Y7	NA	NA	
Duplicate of OB-1	J1B8Y8	NA	NA	
Equipment blank	J1B8Y9	NA	NA	ICP metals [a], mercury
Trip blank	J1B900	NA	NA	VOA

[a] Analysis for 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.

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis
WSP = Washington State Plane

Figure 3. 600-188 Verification Sample Locations.



The 600-188 waste site was excavated to a depth of approximately 2.5 m (8 ft) below ground surface (bgs), and the vadose zone beneath the excavation is approximately 8.8 m (28.8 ft) thick. Twelve statistical verification soil samples and 8 composite verification soil samples were collected on a grid that included this excavated area, the overburden, and the staging pile area footprint.

Verification Sample Results

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. The 95% upper confidence limits (UCLs) on the true population means for residual concentrations of COPCs were calculated for the excavation decision unit as specified by the RDR/RAWP (DOE-RL 2009b), with calculations provided in Appendix B. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the excavation, the maximum detected value was used for comparison to RAGs. The maximum detected value is compared to the RAGs for both the overburden and staging pile area decision units. If no detections for a given COPC were reported in the data set, then no statistical evaluation or calculations were performed for that COPC. Comparisons of the statistical results or maximum for COPCs and the site RAGs for the excavation, staging pile area, and overburden are presented in Tables 3, 4, and 5, respectively.

Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not presented in the RDR/RAWP (DOE-RL 2009b). Parameters to calculate cleanup levels for these constituents are not presented in the Cleanup Levels and Risk Calculations (CLARC) Database (Ecology 2009) under WAC 173-340-740(3) or other reference databases; therefore, these constituents are not considered COPCs and are not included in the tables. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to provision to the Hanford Environmental Information System (HEIS) and are presented as an attachment to the 95% UCL calculation in Appendix B.

Table 3. Comparison of Statistical Values to Remedial Action Goals for the 600-188 Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.239 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.45 (<BG)	20[c]	20 [c]	20 [c]	No	--
Barium	56.8 (<BG)	5,600	200	400	No	--
Beryllium	0.240 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.11	7,200	320	-- [f]	No	--
Cadmium [g]	0.136 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--

Table 3. Comparison of Statistical Values to Remedial Action Goals for the 600-188 Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Chromium (total)	11.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	4.73 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	10.8 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	4.81 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	282 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.350	400	8	-- [f]	No	--
Nickel	12.4 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	0.219 (<BG)	400	5	1	No	--
Vanadium	40.2 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	31.3 (<BG)	24,000	480	67.8 [c]	No	--
TPH – motor oil	116	200	200	200	No	--
Acetone	0.0113	72,000	720	-- [f]	No	--
Methylene chloride	0.00879	133	0.5	0.94	No	--
Chrysene	0.00309	13.7	0.12	0.1 [h]	No	--
Phenanthrene [i]	0.000901	24,000	240	1,920	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) unless otherwise noted.
[b] 95% upper confidence level or maximum value, depending on data censorship, as described in Attachment 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 RDR/RAWP (DOE-RL 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3) (1996) (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2009) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [Ecology 1996] [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. 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).
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: phenanthrene, surrogate: anthracene.

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from *Hanford Site Background: Part 2, Soil Background for Radionuclides* [DOE-RL 1996] or *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes* [DOE-RL 2001], unless otherwise noted)
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)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-188 Staging Pile Area Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do the Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.296 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	2.58 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	83.9 (<BG)	5,600	200	400	No	--
Beryllium	0.347 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	2.28	7,200	320	-- [e]	No	--
Cadmium [e]	0.203 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	11.5 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	6.74 (<BG)	24	15.7 [b]	-- [f]	No	--
Copper	12.9 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	5.84 (<BG)	353	10.2 [b]	10.2 [b]	No	--
Manganese	385 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.562	400	8	-- [f]	No	--
Nickel	11.0 (<BG)	1,600	19.1 [b]	27.4	No	--
Selenium	0.284 (<BG)	400	5	1	No	--
Vanadium	49.6 (<BG)	560	85.1 [b]	-- [f]	No	--
Zinc	43.9 (<BG)	24,000	480	67.8 [b]	No	--
TPH – motor oil	36.9	200	200	200	No	--
Methylene chloride	0.00727	133	0.5	0.94	No	--
Acenaphthene	0.0576	4,800	96	129	No	--
Acenaphthylene [g]	0.0314	4,800	96	129	No	--
Benzo(a)anthracene	0.0295	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(a)pyrene	0.0553	0.137	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(b)fluoranthene	0.0992	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(ghi)perylene [g]	0.103	2,400	48	192	No	--
Benzo(k)fluoranthene	0.0442	1.37	0.015 [h]	0.015 [h]	No	--
Chrysene	0.0424	13.7	0.12	0.1 [h]	No	--
Dibenz(a,h)anthracene	0.00741	1.37	0.03 [h]	0.03 [h]	No	--
Fluoranthene	0.0996	3,200	64	18.0	No	--
Fluorene	0.00308	3,200	64	260	No	--
Indeno(1,2,3-cd) pyrene	0.0797	1.37	0.33 [h]	0.33 [h]	No	--
Phenanthrene [g]	0.0608	24,000	240	1,920	No	--

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-188 Staging Pile Area Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do the Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.0634	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) unless otherwise noted.

[b] 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 RDR/RAWP (DOE-RL 2009b).

[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

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

[e] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2009) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [Ecology 1996] [Method B for surface waters]).

[g] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: acenaphthylene, surrogate: acenaphthene; benzo(ghi)perylene, surrogate: pyrene; phenanthrene, surrogate: anthracene.

[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

[i] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not expected to migrate vertically in 1,000 years (based on the soil distribution coefficient [K_d] of 360 mL/g for benzo(a)anthracene, the constituent with the lowest K_d). The vadose zone underlying the 600-188 waste site staging pile is approximately 11.2 m (36.8 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from *Hanford Site Background: Part 2, Soil Background for Radionuclides* [DOE-RL 1996] or *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes* [DOE-RL 2001], unless otherwise noted)
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)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 5. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-188 Overburden Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do the Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.299 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	2.75 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	89.2 (<BG)	5,600	200	400	No	--
Beryllium	0.375 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	2.23	7,200	320	-- [e]	No	--
Cadmium [f]	0.226 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	13.8 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	6.75 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	13.5 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	8.45 (<BG)	353	10.2 [b]	10.2 [b]	No	--
Manganese	383 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.553	400	8	-- [e]	No	--
Nickel	11.8 (<BG)	1,600	19.1 [b]	27.4	No	--
Selenium	0.218 (<BG)	400	5	1	No	--
Vanadium	51.4 (<BG)	560	85.1 [b]	-- [e]	No	--
Zinc	48.7 (<BG)	24,000	480	67.8 [b]	No	--
TPH – motor oil	39.4	200	200	200	No	--
Acetone	0.00833	72,000	720	-- [e]	No	--
Methylene chloride	0.00849	133	0.5	0.94	No	--
Acenaphthene	0.00124	4,800	96	129	No	--
Acenaphthylene [i]	0.00465	4,800	96	129	No	--
Anthracene	0.000827	24,000	240	1,920	No	--
Benzo(a)anthracene	0.0261	1.37	0.015 [g]	0.015 [g]	Yes	Yes [h]
Benzo(a)pyrene	0.0638	0.137	0.015 [g]	0.015 [g]	Yes	Yes [h]
Benzo(b)fluoranthene	0.0791	1.37	0.015 [g]	0.015 [g]	Yes	Yes [h]
Benzo(ghi)perylene [i]	0.0943	2,400	48	192	No	--
Benzo(k)fluoranthene	0.0399	1.37	0.015 [g]	00.015 [g]	Yes	Yes [h]
Chrysene	0.0402	13.7	0.12	0.1 [g]	No	--
Dibenz(a,h)anthracene	0.00794	1.37	0.03 [g]	0.03 [g]	No	--
Fluoranthene	0.0719	3,200	64	18.0	No	--
Fluorene	0.00194	3,200	64	260	No	--
Indeno(1,2,3-cd) pyrene	0.0701	1.37	0.33 [g]	0.33 [g]	No	--
Phenanthrene [i]	0.00896	24,000	240	1,920	No	--

Table 5. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-188 Overburden Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do the Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.0452	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) unless otherwise noted.
[b] 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 RDR/RAWP (DOE-RL 2009b).
[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (WDOH 1997).
[d] No Hanford Site-specific or Washington State background value available.
[e] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2009) or other databases to calculate cleanup levels (WAC 173-340-730(3)(a)(iii) [Ecology 1996] [Method B for surface waters]).
[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[g] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene are not expected to migrate vertically in 1,000 years (based on the soil distribution coefficient [K_d] of 360 mL/g for benzo(a)anthracene, the constituent with the lowest K_d). The vadose zone underlying the 600-188 waste site excavation, where the overburden will be placed, is approximately 8.8 m (28.8 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: acenaphthylene, surrogate: acenaphthene; benzo(ghi)perylene, surrogate: pyrene; phenanthrene, surrogate: anthracene.

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [1996] or DOE-RL [2001], unless otherwise noted)
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)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

DATA EVALUATION

This section demonstrates that remedial actions at the 600-188 waste site has achieved 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 RDR/RAWP (DOE-RL 2009b). Tables 3 through 5 compare the cleanup verification sample values to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene were detected at levels exceeding soil protection RAGs for groundwater and/or river protection within the staging pile area and/or overburden stockpile. Data were not collected on the vertical extent of these contaminants, but given the lowest soil-partitioning coefficient for these constituents (360 mL/g for benzo(a)anthracene), none of these constituents would be expected to migrate

vertically in 1,000 years based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b). The vadose zone underlying the excavation is approximately 8.8 m (28.8 ft) thick; therefore, residual concentrations of these constituents are predicted to be protective of groundwater. The only pathway for contaminant migration to the Columbia River is via groundwater; therefore, residual concentrations of these contaminants are also predicted to be protective of the Columbia River. All other cleanup verification data values pass in direct comparison to the applicable RAGs.

Three-Part Test for Nonradionuclides

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the *Washington Administrative Code* (WAC) 173-340-740(7)(e) three-part test. The WAC 173-340 three-part test consists of the following criteria: (1) the cleanup verification 95% UCL value must be less than the cleanup level, (2) no single detection can 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 WAC 173-340 three-part test for the 600-188 waste site statistical data is included in the 95% UCL calculation (Appendix B). The results of this evaluation indicate that all residual COPC concentrations pass the three-part test in comparison to applicable RAGs.

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}. Individual and cumulative risk calculations are presented in the direct contact hazard quotient and carcinogenic risk calculation in Appendix B. For the 600-188 waste site, 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 levels. 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 1.8×10^{-3}. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1×10^{-6}, and the cumulative carcinogenic risk value was 6.6×10^{-7}. The 600-188 waste site meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009b).

DATA QUALITY ASSESSMENT

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

The DQA for the 600-188 subsite established that the data are of the right type, quality, and quantity to support site verification 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 the ENRE project-specific database for data evaluation prior to archival in the HEIS and are provided as an attachment to the 95% UCL calculation in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 600-188 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009b). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 600-188 waste site to Interim Closed Out. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

REFERENCES

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

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

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

BHI, 2004, "Results of Geophysical Investigation at Remaining Sites 600-5, 600-100, 600-111/UPR-600-116, 600-109, 600-110, 600-120, 600-124, 600-125, 600-127, and 600-188," CCN 112476 to R. A. Carlson and E. T. Feist from K. A. Bergstrom, T. H. Mitchell, and J. J. Sharpe; Bechtel Hanford, Inc., Richland, Washington, March 24.

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

DOE-RL, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, DOE/RL-96-12, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

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

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

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

Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State,* Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1996, "Model Toxics Control Act – Cleanup," *Washington Administrative Code* (WAC) 173-340, Washington State Department of Ecology, Olympia, Washington.

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

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

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

WCH, 2004, "100 Area IU-2/IU-6 Operable Units Remaining Sites for Remedial Action," CCN 113871 to R. A. Carlson from E. T. Feist, Washington Closure Hanford, Richland, Washington, May 4.

WCH, 2010, *Work Instruction for Verification Sampling of the 600-188, White Bluffs Waste Disposal Trench 2,* 0600X-WI-G0050, Rev. 0, Washington Closure Hanford, Richland, Washington.

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

APPENDIX A

WASTE DESIGNATION AND IN-PROCESS SAMPLE RESULTS

Table A-1. 600-188 Waste Characterization Data. (4 Pages)

Constituent	J19CV7 12/14/09 Soil/distressed area			J19CV8 12/14/09 Soil/distressed area		
	mg/kg	Q	PQL	mg/kg	Q	PQL
Metals						
Aluminum	7,980		3.68	7,700		3.84
Antimony	5.36		0.442	0.46	U	0.46
Arsenic	2.45		0.736	2.48		0.767
Barium	94.1		0.368	75.3		0.384
Beryllium	0.183		0.147	0.226		0.153
Boron	2.13		1.47	1.68		1.53
Cadmium	27		0.147	0.348		0.153
Calcium	3,380		73.6	3,160		76.7
Chromium	15.5		0.147	10.6		0.153
Cobalt	5.97		1.47	6.6		1.53
Copper	162		0.736	15.6		0.767
Iron	20,700		14.7	19,700		15.3
Lead	155		0.368	7.64		0.384
Magnesium	3,140		55.2	3,870		57.6
Manganese	297		3.68	320		3.84
Molybdenum	0.659	B	1.47	0.389	B	1.53
Nickel	9.95		2.94	10.5		3.07
Potassium	1,510		2.94	1,640		307
Selenium	0.221	U	0.221	0.23	U	0.23
Silicon	453		1.47	565		1.53
Silver	0.147	U	0.147	0.153	U	0.153
Sodium	200		36.8	174		38.4
Vanadium	45.2		1.84	50.7		1.92
Zinc	467		7.36	45.1		7.67
Mercury	0.0231	B	0.0265	0.0142	B	0.0237
Constituent	**µg/kg**	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**
Volatile Organic Compounds						
1,1,1-Trichloroethane	5.30	U	5.30	5.04	U	5.04
1,1,2,2-Tetrachloroethane	5.30	U	5.30	5.04	U	5.04
1,1,2-Trichloroethane	5.30	U	5.30	5.04	U	5.04
1,1-Dichloroethane	5.30	U	5.30	5.04	U	5.04
1,1-Dichloroethene	5.30	U	5.30	5.04	U	5.04
1,2-Dichloroethane	6.36	U	6.36	6.05	U	6.05
1,2-Dichloroethene	5.30	U	5.30	5.04	U	5.04
1,2-Dichloropropane	12.7	U	12.7	12.1	U	12.1
2-Butanone	12.7	U	12.7	12.1	U	12.1
2-Hexanone	12.7	U	12.7	12.1	U	12.1
4-Methyl-2-Pentanone	5.30	U	5.30	5.04	U	5.04
Acetone	6.36	U	6.36	6.05	U	6.05
Benzene	5.30	U	5.30	5.04	U	5.04
Bromodichloromethane	10.6	U	10.6	10.1	U	10.1

Table A-1. 600-188 Waste Characterization Data. (4 Pages)

Constituent	µg/kg	Q	PQL	µg/kg	Q	PQL
Volatile Organic Compounds						
Bromoform	5.30	U	5.30	5.04	U	5.04
Bromomethane	5.30	U	5.30	5.04	U	5.04
Carbon disulfide	5.30	U	5.30	5.04	U	5.04
Carbon tetrachloride	10.6	U	10.6	10.1	U	10.1
Chlorobenzene	5.30	U	5.30	5.04	U	5.04
Chloroethane	10.6	U	10.6	10.1	U	10.1
Chloroform	5.30	U	5.30	5.04	U	5.04
Chloromethane	5.30	U	5.30	5.04	U	5.04
cis-1,2-Dichloroethene	5.30	U	5.30	5.04	U	5.04
cis-1,3-Dichloropropene	5.30	U	5.30	5.04	U	5.04
Dibromochloromethane	5.30	U	5.30	5.04	U	5.04
Ethylbenzene	5.30	U	5.30	5.04	U	5.04
Methylenechloride	2.22	J	6.36	5.04	U	5.04
Styrene	5.30	U	5.30	5.04	U	5.04
Tetrachloroethene	5.30	U	5.30	5.04	U	5.04
trans-1,2-Dichloroethene	5.30	U	5.30	5.04	U	5.04
Toluene	5.30	U	5.30	5.04	U	5.04
trans-1,3-Dichloropropene	5.30	U	5.30	5.04	U	5.04
Trichloroethene	5.30	U	5.30	5.04	U	5.04
Vinyl chloride	10.6	U	10.6	10.1	U	10.1
Xylenes (total)	6.36	U	6.36	6.05	U	6.05
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	700	U	700	679	U	679
1,2-Dichlorobenzene	700	U	700	679	U	679
1,3-Dichlorobenzene	700	U	700	679	U	679
1,4-Dichlorobenzene	700	U	700	679	U	679
2,4,5-Trichlorophenol	700	U	700	679	U	679
2,4,6-Trichlorophenol	700	U	700	679	U	679
2,4-Dichlorophenol	700	U	700	679	U	679
2,4-Dimethylphenol	700	U	700	679	U	679
2,4-Dinitrophenol	3,500	U	3,500	3390	U	3390
2,4-Dinitrotoluene	700	U	700	679	U	679
2,6-Dinitrotoluene	1,400	U	1,400	1360	U	1360
2-Chloronaphthalene	3,500	U	3,500	3390	U	3390
2-Chlorophenol	700	U	700	679	U	679
2-Methylnaphthalene	700	U	700	679	U	679
2-Methylphenol (cresol, o-)	700	U	700	679	U	679
2-Nitroaniline	700	U	700	679	U	679
2-Nitrophenol	700	U	700	679	U	679
3,3'-Dichlorobenzidine	700	U	700	679	U	679
3-Nitroaniline	700	U	700	679	U	679
4,6-Dinitro-2-methylphenol	700	U	700	679	U	679
4-Bromophenylphenyl ether	700	U	700	679	U	679
4-Chloro-3-methylphenol	700	U	700	679	U	679
4-Chloroaniline	700	U	700	679	U	679

Table A-1. 600-188 Waste Characterization Data. (4 Pages)

Constituent	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds						
4-Chlorophenylphenyl ether	700	U	700	679	U	679
3- and/or 4-Methylphenol	700	U	700	679	U	679
4-Nitroaniline	3,500	U	3,500	3390	U	3390
4-Nitrophenol	3,500	U	3,500	3390	U	3390
Acenaphthene	700	U	700	679	U	679
Acenaphthylene	700	U	700	679	U	679
Anthracene	700	U	700	679	U	679
Benzo(a)anthracene	700	U	700	679	U	679
Benzo(a)pyrene	700	U	700	679	U	679
Benzo(b)fluoranthene	700	U	700	679	U	679
Benzo(ghi)perylene	700	U	700	679	U	679
Benzo(k)fluoranthene	700	U	700	679	U	679
Bis(2-Chloroethoxy)methane	700	U	700	679	U	679
Bis(2-chloroethyl) ether	700	U	700	679	U	679
Bis(2-isopropyl) ether	700	U	700	679	U	679
Bis(2-ethylhexyl) phthalate	700	U	700	679	U	679
Butylbenzylphthalate	700	U	700	679	U	679
Carbazole	700	U	700	679	U	679
Chrysene	700	U	700	679	U	679
Dibenz[a,h]anthracene	700	U	700	679	U	679
Dibenzofuran	700	U	700	679	U	679
Diethyl phthalate	700	U	700	679	U	679
Dimethyl phthalate	700	U	700	679	U	679
Di-n-butyl Phthalate	700	U	700	679	U	679
Di-n-octyl Phthalate	700	U	700	679	U	679
Fluoranthene	700	U	700	679	U	679
Fluorene	700	U	700	679	U	679
Hexachlorobenzene	700	U	700	679	U	679
Hexachlorobutadiene	700	U	700	679	U	679
Hexachlorocyclopentadiene	700	U	700	679	U	679
Hexachloroethane	700	U	700	679	U	679
Indeno(1,2,3-cd)pyrene	700	U	700	679	U	679
Isophorone	700	U	700	679	U	679
Naphthalene	135	JD	700	679	U	679
Nitrobenzene	700	U	700	679	U	679
N-Nitroso-di-n-dipropylamine	700	U	700	679	U	679
N-Nitrosodiphenylamine	700	U	700	679	U	679
Pentachlorophenol	3,500	U	3,500	3390	U	3390
Phenanthrene	700	U	700	679	U	679
Phenol	700	U	700	679	U	679
Pyrene	700	U	700	679	U	679

Table A-1. 600-188 Waste Characterization Data. (4 Pages)

Constituent	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls						
Aroclor-1016	14.1	U	14.1	13.7	U	13.7
Aroclor-1221	14.1	U	14.1	13.7	U	13.7
Aroclor-1232	14.1	U	14.1	13.7	U	13.7
Aroclor-1248	14.1	U	14.1	13.7	U	13.7
Aroclor-1254	14.1	U	14.1	13.7	U	13.7
Aroclor-1260	14.1	U	14.1	13.7	U	13.7
Pesticides						
alpha-BHC	1.41	U	1.41	1.37	U	1.37
gamma-BHC	1.41	U	1.41	1.37	U	1.37
beta-BHC	1.41	U	1.41	1.37	U	1.37
delta-BHC	1.41	U	1.41	1.37	U	1.37
Heptachlor	1.41	U	1.41	1.37	U	1.37
Aldrin	1.41	U	1.41	1.37	U	1.37
Heptachlor epoxide	1.41	U	1.41	1.37	U	1.37
gamma-Chlordane	1.41	U	1.41	1.37	U	1.37
alpha-Chlordane	1.41	U	1.41	1.37	U	1.37
Endosulfan I	2.83	JD	1.41	1.37	U	1.37
4,4'-DDE	3.53	JD	1.41	1.37	U	1.37
Dieldrin	1.41	U	1.41	1.37	U	1.37
Endrin	1.41	U	1.41	1.37	U	1.37
4,4'-DDD	1.41	U	1.41	1.37	U	1.37
Endosulfan II	1.41	U	1.41	1.37	U	1.37
4,4'-DDT	1.41	U	1.41	1.37	U	1.37
Endrin aldehyde	1.41	U	1.41	1.37	U	1.37
Endosulfan sulfate	1.41	U	1.41	1.37	U	1.37
Methoxychlor	1.41	U	1.41	1.37	U	1.37
Endrin ketone	1.41	U	1.41	1.37	U	1.37
Toxaphene	21.2	U	21.2	20.6	U	20.6

B = blank contamination (organic constituents); estimated result (inorganic constituents)
BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
J = estimated result
Q = qualifier
PQL = practical quantitation limit
U = undetected

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample			J19L38 03/03/10 Equipment Blank		
	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Metals															
Aluminum	9,310		3.6	6,060		4.99	7,030		4.91	8,320		5.27	70.7		4.1
Antimony	0.432	U	0.432	0.0525	B	0.599	0.59	U	0.59	0.632	U	0.632	0.492	U	0.49
Arsenic	2.73		0.72	2.32		0.999	2.75		0.983	2.37		1.05	0.82	U	0.82
Barium	92.8		0.36	49		0.499	65.4		0.491	82.1		0.527	0.847		0.41
Beryllium	0.279		0.144	0.19	B	0.2	0.206		0.197	0.256		0.211	0.164	U	0.16
Boron	1.94		1.44	1.03	B	2	1.31	B	1.97	1.77	B	2.11	1.64	U	1.64
Cadmium	0.182		0.144	0.113	B	0.2	0.133	B	0.197	0.169	B	0.211	0.164	U	0.16
Calcium	3,810		72	4,440		99.9	4,120		98.3	3,730		105	13.1	B	82
Chromium	11.5		0.144	11.9		0.2	11		0.197	10.7		0.211	0.164	U	0.16
Cobalt	7.31		1.44	4.68		2	5.9		1.97	7.12		2.11	1.64	U	1.64
Copper	13.1		0.72	10.6		0.999	12		0.983	12.8		1.05	0.82	U	0.82
Iron	23,100		14.4	15,900		20	19,800		19.7	22,200		21.1	104		16.4
Lead	5.72		0.36	5.08		0.499	4.1		0.491	4.91		0.527	0.41	U	0.41
Magnesium	4,380		54	3,540		74.9	3,910		73.7	4,070		79	6.82	B	61.5
Manganese	367		3.6	253		4.99	294		4.91	346		5.27	3.21	B	4.1
Molybdenum	0.421	B	1.44	0.27	B	2	0.336	B	1.97	0.355	B	2.11	1.64	U	1.64
Nickel	10.4		2.88	9.15		3.99	9.02		3.93	9.58		4.21	3.28	U	3.28
Potassium	1,880		288	1,110		399	1,280		393	1,700		421	23	B	328
Selenium	0.216	U	0.216	0.3	U	0.3	0.295	U	0.295	0.316	U	0.316	0.246	U	0.25
Silicon	699		1.44	479		2	550		1.97	574		2.11	75.4		1.64
Silver	0.144	U	0.144	0.2	U	0.2	0.197	U	0.197	0.211	U	0.211	0.164	U	0.16
Sodium	198		36	134		49.9	161		49.1	180		52.7	41	U	41
Vanadium	57.1		1.8	37.8		2.5	51.2		2.46	55.8		2.63	2.05	U	2.05
Zinc	48.5		7.2	32.9		9.99	40.1		9.83	46		10.5	8.2	U	8.2
Mercury	0.0308	U	0.0308	0.0298	U	0.0298	0.0286	U	0.0286	0.0308	U	0.0308	0.026	U	0.03

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Volatile Organic Compounds												
1,1,1-Trichloroethane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,1,2,2-Tetrachloroethane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,1,2-Trichloroethane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,1-Dichloroethane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,1-Dichloroethene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,2-Dichloroethane	6.44	U	6.44	5.88	U	5.88	6.01	U	6.01	6.57	U	6.57
1,2-Dichloroethene (total)	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
1,2-Dichloropropane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
2-Butanone	12.9	U	12.9	11.8	U	11.8	12	U	12	13.1	U	13.1
2-Hexanone	12.9	U	12.9	11.8	U	11.8	12	U	12	13.1	U	13.1
4-Methyl-2-Pentanone	12.9	U	12.9	11.8	U	11.8	12	U	12	13.1	U	13.1
Acetone	12.9	U	12.9	11.8	U	11.8	6.95	J	6.95	13.1	U	13.1
Benzene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Bromodichloromethane	6.44	U	6.44	5.88	U	5.88	6.01	U	6.01	6.57	U	6.57
Bromoform	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Bromomethane	10.7	U	10.7	9.8	U	9.8	10	U	10	11	U	11
Carbon disulfide	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Carbon tetrachloride	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Chlorobenzene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Chloroethane	10.7	U	10.7	9.8	U	9.8	10	U	10	11	U	11
Chloroform	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Chloromethane	10.7	U	10.7	9.8	U	9.8	10	U	10	11	U	11
cis-1,2-Dichloroethylene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
cis-1,3-Dichloropropene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Dibromochloromethane	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Ethylbenzene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Methylenechloride	7.34		5.37	5.96		4.9	5.3	J	5	6.06	J	5.48
Styrene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Tetrachloroethene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Toluene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
trans-1,2-Dichloroethylene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
trans-1,3-Dichloropropene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Trichloroethene	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Vinyl chloride	10.7	U	10.7	9.8	U	9.8	10	U	10	11	U	11
Xylenes (total)	5.37	U	5.37	4.9	U	4.9	5	U	5	5.48	U	5.48
Semivolatile Organic Compounds												
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
1,2,4-Trichlorobenzene	361	U	361	349	U	349	357	U	357	362	U	362
1,2-Dichlorobenzene	361	U	361	349	U	349	357	U	357	362	U	362
1,3-Dichlorobenzene	361	U	361	349	U	349	357	U	357	362	U	362
1,4-Dichlorobenzene	361	U	361	349	U	349	357	U	357	362	U	362

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
2,4,5-Trichlorophenol	361	U	361	349	U	349	357	U	357	362	U	362
2,4,6-Trichlorophenol	361	U	361	349	U	349	357	U	357	362	U	362
Semivolatile Organic Compounds												
2,4-Dichlorophenol	361	U	361	349	U	349	357	U	357	362	U	362
2,4-Dimethylphenol	361	U	361	349	U	349	357	U	357	362	U	362
2,4-Dinitrophenol	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
2,4-Dinitrotoluene	361	U	361	349	U	349	357	U	357	362	U	362
2,6-Dinitrotoluene	361	U	361	349	U	349	357	U	357	362	U	362
2-Chloronaphthalene	361	U	361	349	U	349	357	U	357	362	U	362
2-Chlorophenol	361	U	361	349	U	349	357	U	357	362	U	362
2-Methylnaphthalene	361	U	361	349	U	349	357	U	357	362	U	362
2-Methylphenol (cresol, o-)	361	U	361	349	U	349	357	U	357	362	U	362
2-Nitroaniline	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
2-Nitrophenol	361	U	361	349	U	349	357	U	357	362	U	362
3+4 Methylphenol (cresol, m+p)	361	U	361	349	U	349	357	U	357	362	U	362
3,3'-Dichlorobenzidine	723	U	723	699	U	699	713	U	713	723	U	723
3-Nitroaniline	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
4,6-Dinitro-2-methylphenol	361	U	361	349	U	349	357	U	357	362	U	362
4-Bromophenylphenyl ether	361	U	361	349	U	349	357	U	357	362	U	362
4-Chloro-3-methylphenol	361	U	361	349	U	349	357	U	357	362	U	362
4-Chloroaniline	361	U	361	349	U	349	357	U	357	362	U	362
4-Chlorophenylphenyl ether	361	U	361	349	U	349	357	U	357	362	U	362
4-Nitroaniline	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
4-Nitrophenol	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
Acenaphthene	361	U	361	349	U	349	357	U	357	362	U	362
Acenaphthylene	361	U	361	349	U	349	357	U	357	362	U	362
Anthracene	361	U	361	349	U	349	357	U	357	362	U	362
Benzo(a)anthracene	361	U	361	349	U	349	357	U	357	362	U	362
Benzo(a)pyrene	361	U	361	349	U	349	357	U	357	362	U	362
Benzo(b)fluoranthene	361	U	361	349	U	349	357	U	357	362	U	362
Benzo(ghi)perylene	361	U	361	349	U	349	357	U	357	362	U	362
Benzo(k)fluoranthene	361	U	361	349	U	349	357	U	357	362	U	362
Bis(2-chloro-1-methylethyl)ether	361	U	361	349	U	349	357	U	357	362	U	362
Bis(2-Chloroethoxy)methane	361	U	361	349	U	349	357	U	357	362	U	362
Bis(2-chloroethyl) ether	361	U	361	349	U	349	357	U	357	362	U	362
Bis(2-ethylhexyl) phthalate	361	U	361	349	U	349	357	U	357	362	U	362
Butylbenzylphthalate	361	U	361	349	U	349	357	U	357	362	U	362
Carbazole	361	U	361	349	U	349	357	U	357	362	U	362
Chrysene	361	U	361	349	U	349	357	U	357	362	U	362

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Di-n-butylphthalate	361	U	361	349	U	349	357	U	357	362	U	362
Di-n-octylphthalate	361	U	361	349	U	349	357	U	357	362	U	362
Dibenz[a,h]anthracene	361	U	361	349	U	349	357	U	357	362	U	362
Dibenzofuran	361	U	361	349	U	349	357	U	357	362	U	362
Semivolatile Organic Compounds												
Diethyl phthalate	361	U	361	349	U	349	357	U	357	362	U	362
Dimethyl phthalate	361	U	361	349	U	349	357	U	357	362	U	362
Fluoranthene	361	U	361	349	U	349	357	U	357	362	U	362
Fluorene	361	U	361	349	U	349	357	U	357	362	U	362
Hexachlorobenzene	361	U	361	349	U	349	357	U	357	362	U	362
Hexachlorobutadiene	361	U	361	349	U	349	357	U	357	362	U	362
Hexachlorocyclopentadiene	361	U	361	349	U	349	357	U	357	362	U	362
Hexachloroethane	361	U	361	349	U	349	357	U	357	362	U	362
Indeno(1,2,3-cd)pyrene	361	U	361	349	U	349	357	U	357	362	U	362
Isophorone	361	U	361	349	U	349	357	U	357	362	U	362
N-Nitroso-di-n-dipropylamine	361	U	361	349	U	349	357	U	357	362	U	362
N-Nitrosodiphenylamine	361	U	361	349	U	349	357	U	357	362	U	362
Naphthalene	361	U	361	349	U	349	357	U	357	362	U	362
Nitrobenzene	361	U	361	349	U	349	357	U	357	362	U	362
Pentachlorophenol	1810	U	1810	1750	U	1750	1780	U	1780	1810	U	1810
Phenanthrene	361	U	361	349	U	349	357	U	357	362	U	362
Phenol	361	U	361	349	U	349	357	U	357	362	U	362
Pyrene	361	U	361	349	U	349	357	U	357	362	U	362
Pesticides												
Aldrin	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Alpha-BHC	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
alpha-Chlordane	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
beta-1,2,3,4,5,6-Hexachlorocyclo hexane	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Delta-BHC	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Dichlorodiphenyl dichloroethane	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Dichlorodiphenyl dichloroethylene	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Dichlorodiphenyl trichloroethane	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Dieldrin	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endosulfan I	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endosulfan II	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endosulfan sulfate	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endrin	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endrin aldehyde	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Endrin ketone	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Gamma-BHC (lindane)	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
gamma-Chlordane	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Heptachlor	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Heptachlor epoxide	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Methoxychlor	1.46	UD	1.46	1.41	UD	1.41	1.44	UD	1.44	1.46	UD	1.46
Toxaphene	21.9	UD	21.9	21.2	UD	21.2	21.6	UD	21.6	21.9	UD	21.9

Table A-2. 600-188 In-Process Sample Data. (6 Pages)

Constituent	J19L34 03/03/10 Soil Sample			J19L35 03/03/10 Soil Sample			J19L36 03/03/10 Soil Sample			J19L37 03/03/10 Soil Sample		
	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Wet Chemistry												
Cyanide	0.53	U	0.53	0.45	U	0.45	0.52	U	0.52	0.53	U	0.53
Sulfide	11.3		21.9	6.43		21.2	13		21.6	11		21.9
Total Petroleum Hydrocarbons												
Diesel range	3.61	U	3.61	3.49	U	3.49	3.57	U	3.57	3.62	U	3.62
Motor oil	14.9		10.9	10.3	J	10.6	5.52	J	10.8	11.9		11
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Acenaphthylene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Anthracene	3.65		3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Benzo(a)anthracene	3.65	U	3.65	1.39	J	3.53	3.6	U	3.6	3.65	U	3.65
Benzo(a)pyrene	3.65	U	3.65	1.13	J	3.53	3.6	U	3.6	3.65	U	3.65
Benzo(b)fluoranthene	3.65	U	3.65	2.13	J	3.53	3.6	U	3.6	3.65	U	3.65
Benzo(ghi)perylene	3.65	U	3.65	0.882	J	3.53	3.6	U	3.6	3.65	U	3.65
Benzo(k)fluoranthene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Chrysene	3.65	U	3.65	3.37	J	3.53	3.6	U	3.6	0.95	J	3.65
Dibenz[a,h]anthracene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Fluoranthene	7.66		3.65	14.3		3.53	6.13		3.6	3.65	U	3.65
Fluorene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Indeno(1,2,3-cd) pyrene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Naphthalene	3.65	U	3.65	3.53	U	3.53	3.6	U	3.6	3.65	U	3.65
Phenanthrene	3.65	U	3.65	3.71		3.53	3.6	U	3.6	1.46	J	3.65
Pyrene	3.65	U	3.65	1.27	J	1.27	3.6	U	3.6	3.65	U	3.65

B = blank contamination (organic constituents); estimated result (inorganic constituents)
BHC = benzene hexachloride
J = estimated result
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX B

95% UPPER CONFIDENCE LIMIT, DIRECT CONTACT HAZARD QUOTIENT, AND CARCINOGENIC RISK CALCULATION

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2 Field Remediation **Job No. 14655**

Area: 100-IU-2

Discipline: Environmental Calculation No: 0600X-CA-V0100

Subject: 600-188 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations

Computer Program: Excel Program No: Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 3 Total = 4	T. E. Queen TEQueen	J. D. Skoglie JDSkoglie	B. L. Vedder BLVedder	D. F. Obenauer D. F. Obenauer	1/20/11

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007)

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0600X-CA-V0100	Rev.:	0
Project:	100-IU-2 Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	600-188 Waste Site 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 600-188 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009a), 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, *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.

2) DOE-RL, 2009b, *100 Area Remedial Action Sampling and Analysis Plan,* DOE/RL-96-22, Rev. 5, 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, 2011, *Remaining Sites Verification Package for the 600-188 White Bluffs Waste Disposal Trench 2*, Attachment to Waste Site Reclassification Form 2010-090, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2009a).

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 2009a).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0600X-CA-V0100	Rev.:	0
Project:	100-IU-2 Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	600-188 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

The 600-188 waste site is comprised of three decision units for verification sampling, consisting of the excavation, staging pile area footprint, and the overburden stockpile. The direct contact hazard quotient and carcinogenic risk calculations for the 600-188 waste site were conservatively calculated for the entire waste site using the greater of the statistical and composite verification soil sample results (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, boron, molybdenum, the detected polycyclic aromatic hyrdrocarbons, and the detected volatile organic compounds require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Although total petroleum hydrocarbons (motor oil) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.28 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 3.2×10^{-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 1.8×10^{-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 maximum value for benzo(a)pyrene is 0.0638 mg/kg, divided by 0.137 mg/kg, and multiplied as indicated, is 4.7×10^{-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. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 6.6×10^{-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, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0600X-CA-V0100	Rev.:	0
Project:	100-IU-2 Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	600-188 Waste Site 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 600-188 Waste Site.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.28	7,200	3.2E-04	--	--
Molybdenum	0.562	400	1.4E-03	--	--
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.0576	4,800	1.2E-05	--	--
Acenaphthylene[c]	0.0314	4,800	6.5E-06	--	--
Anthracene	0.000827	24,000	3.4E-08	--	--
Benzo(a)anthracene	0.0295	--	--	1.37	2.2E-08
Benzo(a)pyrene	0.0638	--	--	0.137	4.7E-07
Benzo(b)fluoranthene	0.0992	--	--	1.37	7.2E-08
Benzo(ghi)perylene[c]	0.103	2,400	4.3E-05	--	--
Benzo(k)fluoranthene	0.0442	--	--	1.37	3.2E-08
Chrysene	0.0424	--	--	13.7	3.1E-09
Dibenz(a,h)anthracene	0.00794	--	--	1.37	5.8E-09
Fluoranthene	0.0996	3,200	3.1E-05	--	--
Fluorene	0.00308	3,200	9.6E-07	--	--
Indeno(1,2,3-cd)pyrene	0.0797	--	--	1.37	5.8E-08
Phenanthrene[c]	0.0608	24,000	2.5E-06	--	--
Pyrene	0.0634	2,400	2.6E-05	--	--
Volatiles					
Acetone	0.0113	72,000	1.6E-07	--	
Methylene chloride	0.00879	4,800	1.8E-06	133	6.6E-11
Total Petroleum Hydrocarbons					
Diesel range and motor oil [d]	116	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**1.8E-03**		
Cumulative Excess Cancer Risk:					**6.6E-07**

[a] = From WCH (2011).

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

[c] = Toxicity data for these chemicals are not available. RAGs are based on surrogate chemicals.

Contaminant: acenapthylene; surrogate: acenaphthene

Contaminant: benzo(ghi)perylene, surrogate: pyrene

Contaminant: phenanthrene; surrogate: anthracene

[d] = The risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation.

-- = not applicable RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrates that the 600-188 waste site meets the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The direct contact hazard quotients and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Washington Closure Hanford **CALCULATION SHEET**

Originator T. E. Queen	**Date** 01/12/11	**Calc. No.** 0600X-CA-V0098	**Rev. No.** 0
Project 100-IU-2/6 Field Remediation	**Job No.** 14655	**Checked** J. D. Skoglie	**Date** 01/12/11
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 1 of 11

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
Sheet 5 to 6 - Calculation Sheet Verification Data
Sheet 7 to 8 - Ecology Software (MTCAStat) Results
Sheet 9 to 11 - Calculation Sheet Duplicate Analysis
Attachment 1 - 600-188, Verification Sampling Results (14 sheets)

Given/References:
1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are taken from DOE-RL (2005b), DOE-RL (2001), and Ecology (1996).
3) DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) 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.
5) 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.
6) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
7) 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.
8) Ecology, 1996, *Model Toxic Control Act Cleanup Levels and Risk Calculations (CLARC II),* Publication #94-145, Washington State Department of Ecology, Olympia, Washington.
9) Ecology, 2005, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
10) 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 2005b). 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 direct contact 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 data from soil verification samples (Attachment 1) from the 600-188 waste site. The data were entered into an EXCEL 2003 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 600-188 waste site consisted of 3 decision units for verification sampling: the excavation area, the staging pile area, and the overburden stockpile.

Analytical results for all sampling locations are summarized in the tables provided on sheets 3 & 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 T. E. Queen **Date** 01/12/11 **Calc. No.** 0600X-CA-V0098 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 01/12/11
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 2 of 11

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 (which includes primary and duplicate samples) 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 (2005) under WAC 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents 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 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 WAC 173-340-740(7)(e) 3-part test is not performed for COPCs where the statistical value defaults to the maximum value in the data set. Instead, direct comparison of the maximum value against site remedial action goals (RAGs) (within the RSVP) is used as the compliance basis.

The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table II-1 of the SAP (DOE-RL 2009a) for certain constituents with cleanup levels. All other constituents will have their own pre-determined TDL's based on laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30% further investigation regarding the usability of the data is performed. 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 T. E. Queen **Date** 01/12/11 **Calc. No.** 0600X-CA-V0098 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 01/12/11
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 3 of 11

Summary (continued)

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, staging pile area, overburden stockpile, the WAC 173-340-740(7)(e) 3-part test evaluation, the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary - Excavation [a]

Analyte	95% UCL Result	Maximum Result	Units
Arsenic	2.45	--	mg/kg
Barium	56.8	--	mg/kg
Beryllium	0.240	--	mg/kg
Boron	1.11	--	mg/kg
Cadmium	0.136	--	mg/kg
Chromium	11.6	--	mg/kg
Cobalt	4.73	--	mg/kg
Copper	10.8	--	mg/kg
Lead	4.81	--	mg/kg
Manganese	282	--	mg/kg
Molybdenum	0.350	--	mg/kg
Nickel	12.4	--	mg/kg
Vanadium	40.2	--	mg/kg
Zinc	31.3	--	mg/kg
Antimony	--	0.239	mg/kg
Selenium	--	0.219	mg/kg
TPH - motor oil	--	116	mg/kg
Acetone	--	0.0113	mg/kg
Methylene chloride	--	0.00879	mg/kg
Chrysene	--	0.00309	mg/kg
Phenanthrene	--	0.000901	mg/kg

WAC 173-340-740(7)(e) Evaluation:

WAC 173-340 3-Part Test for most stringent RAG:
95% UCL > Cleanup Limit? NO
> 10% above Cleanup Limit? NO
Any sample > 2x Cleanup Limit? NO

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

Results Summary - Staging Pile Area

Analyte	Maximum Result	Units
Antimony	0.296	mg/kg
Arsenic	2.58	mg/kg
Barium	83.9	mg/kg
Beryllium	0.347	mg/kg
Boron	2.28	mg/kg
Cadmium	0.203	mg/kg
Chromium	11.5	mg/kg
Cobalt	6.74	mg/kg
Copper	12.9	mg/kg
Lead	5.84	mg/kg
Manganese	385	mg/kg
Molybdenum	0.562	mg/kg
Nickel	11.0	mg/kg
Selenium	0.284	mg/kg
Vanadium	49.6	mg/kg
Zinc	43.9	mg/kg
TPH - motor oil	36.9	mg/kg
Methylene chloride	0.00727	mg/kg
Acenapthene	0.0576	mg/kg
Acenapthylene	0.0314	mg/kg
Benzo(a)anthracene	0.0295	mg/kg
Benzo(a)pyrene	0.0553	mg/kg
Benzo(b)fluoranthene	0.0992	mg/kg
Benzo(ghi)perylene	0.103	mg/kg
Benzo(k)fluoranthene	0.0442	mg/kg
Chrysene	0.0424	mg/kg
Dibenz[a,h]anthracene	0.00741	mg/kg
Fluoranthene	0.0996	mg/kg
Fluorene	0.00308	mg/kg
Indeno(1,2,3-cd)pyrene	0.0797	mg/kg
Phenanthrene	0.0608	mg/kg
Pyrene	0.0634	mg/kg

-- = not applicable
B = blank contamination (inorganic constituents)
C = Sample was </= 5X the blank concentration
DE = direct exposure
GW = groundwater
J = estimate
indicating
M = sample duplicate precision not met
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
TDL = target detection limit
U = undetected
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford

CALCULATION SHEET

Originator T. E. Queen **Date** 01/12/11 **Calc. No.** 0600X-CA-V0098 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 01/12/11
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 11

Summary (continued)

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, staging pile area, overburden stockpile, the WAC 173-340-740(7)(e) 3-part test evaluation, the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary - Overbuden

Analyte	Maximum Result	Units
Antimony	0.299	mg/kg
Arsenic	2.75	mg/kg
Barium	89.2	mg/kg
Beryllium	0.375	mg/kg
Boron	2.23	mg/kg
Cadmium	0.226	mg/kg
Chromium	13.8	mg/kg
Cobalt	6.75	mg/kg
Copper	13.5	mg/kg
Lead	8.45	mg/kg
Manganese	383	mg/kg
Molybdenum	0.553	mg/kg
Nickel	11.8	mg/kg
Selenium	0.218	mg/kg
Vanadium	51.4	mg/kg
Zinc	48.7	mg/kg
TPH - motor oil	39.4	mg/kg
Acetone	0.00833	mg/kg
Methylene chloride	0.00849	mg/kg
Acenpthene	0.00124	mg/kg
Acenapthylene	0.00465	mg/kg
Anthracene	0.000827	mg/kg
Benzo(a)anthracene	0.0261	mg/kg
Benzo(a)pyrene	0.0638	mg/kg
Benzo(b)fluoranthene	0.0791	mg/kg
Benzo(ghi)perylene	0.0943	mg/kg
Benzo(k)fluoranthene	0.0399	mg/kg
Chrysene	0.0402	mg/kg
Dibenz[a,h]anthracene	0.00794	mg/kg
Fluoranthene	0.0719	mg/kg
Fluorene	0.00194	mg/kg
Indeno(1,2,3-cd)pyrene	0.0701	mg/kg
Phenanthrene	0.00896	mg/kg
Pyrene	0.0452	mg/kg

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

Analyte	Excavation	Staging Pile Area	Overburden
	Duplicate Analysis		
Aluminum	6.04%	0.112%	10.8%
Barium	41.8%	2.41%	14.3%
Calcium	2.32%	3.08%	1.21%
Chromium	5.61%	0.000%	6.33%
Copper	2.45%	3.15%	6.45%
Iron	4.06%	0.917%	0.464%
Magnesium	3.05%	1.45%	2.70%
Manganese	37.3%	0.521%	5.79%
Potassium		6.15%	
Silicon	14.2%	29.5%	46.2%
Vanadium	2.64%	2.50%	9.37%
Zinc	2.30%	2.07%	11.6%

[a]RPD listed where result produced, based on criteria. If RPD not required, no value is listed. The significance of the reported RPD values, including values greater than 30%, is addressed in the data quality assessment section of the RSVP.

CALCULATION SHEET

Washington Closure Hanford
Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0600X-CA-V0098
Checked J. E. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 5 of 11

1 600-188 Statistical Calculations

2 Verification Data - Excavation

3	Sample Area	Sample Number	Sample Date	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper		
4				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
5	EX-5	J1B8W7	9/8/10	2.10		0.778	86.3		0.369	0.326		0.156	1.91		1.56	0.184		0.156	11.0		0.156	6.73		1.55	12.1		0.778
6	Duplicate of J1B8W7	J1B8Y2	9/8/10	2.30		0.667	135		0.334	0.337		0.133	1.94		1.33	0.188		0.133	10.4		0.133	7.03		1.33	12.4		0.667
7	EX-1	J1B8W6	9/8/10	2.24		0.657	35.0		0.328	0.180		0.131	0.629	B	1.31	0.0864	B	0.131	9.24		0.131	3.27		1.31	9.22		0.657
8	EX-2	J1B8X0	9/8/10	1.83		0.738	75.2		0.369	0.287		0.148	1.63		1.48	0.172		0.148	9.37		0.148	5.26		1.48	11.4		0.738
9	EX-3	J1B8W8	9/8/10	2.55		0.733	34.8		0.366	0.184		0.147	0.724	B	1.47	0.0981	B	0.147	12.0		0.147	3.72		1.47	9.83		0.733
10	EX-4	J1B8W9	9/8/10	2.81		0.733	39.5		0.366	0.214		0.147	0.920	B	1.47	0.109	B	0.147	11.1		0.147	3.99		1.47	10.3		0.733
11	EX-6	J1B8X1	9/8/10	2.14		0.696	31.1		0.348	0.189		0.139	0.535	B	1.39	0.0790	B	0.139	8.96		0.139	3.07		1.39	8.84		0.696
12	EX-7	J1B8X2	9/8/10	2.44		0.664	29.0		0.332	0.189		0.133	0.710	B	1.33	0.0960	B	0.133	10.4		0.133	3.27		1.33	10.2		0.664
13	EX-8	J1B8X3	9/8/10	2.36		0.772	37.0		0.386	0.206		0.154	0.646	B	1.54	0.0936	B	0.154	11.5		0.154	3.35		1.54	8.29		0.772
14	EX-9	J1B8X4	9/8/10	2.44		0.771	40.4		0.356	0.218		0.154	0.693	B	1.54	0.112	B	0.154	13.8		0.154	4.21		1.54	10.3		0.771
15	EX-10	J1B8X5	9/8/10	2.38		0.665	33.3		0.333	0.204		0.133	0.605	B	1.33	0.0870	B	0.133	9.89		0.133	3.17		1.33	8.20		0.665
16	EX-11	J1B8X6	9/8/10	2.02		0.627	36.7		0.314	0.207		0.125	0.799	B	1.25	0.0947	B	0.125	11.0		0.125	4.10		1.25	10.0		0.627
17	EX-12	J1B8X7	9/8/10	2.23		0.798	41.0		0.398	0.217		0.159	1.00	B	1.59	0.160		0.159	11.9		0.159	4.48		1.59	12.1		0.798

18 Statistical Computation Input Data

20	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
22	EX-5	J1B8W7/ J1B8Y2	9/8/10	2.20	112	0.332	1.93	0.186	10.7	6.88	12.3
23	EX-1	J1B8W6	9/8/10	2.24	35.0	0.180	0.629	0.0864	9.24	3.27	9.22
24	EX-2	J1B8X0	9/8/10	1.83	75.2	0.287	1.63	0.172	9.37	5.26	11.4
25	EX-3	J1B8W8	9/8/10	2.55	34.8	0.184	0.724	0.0981	12.0	3.72	9.83
26	EX-4	J1B8W9	9/8/10	2.81	39.5	0.214	0.920	0.109	11.1	3.99	10.3
27	EX-6	J1B8X1	9/8/10	2.14	31.1	0.189	0.535	0.0790	8.96	3.07	8.84
28	EX-7	J1B8X2	9/8/10	2.44	29.0	0.189	0.710	0.0960	10.4	3.27	10.2
29	EX-8	J1B8X3	9/8/10	2.36	37.0	0.206	0.646	0.0936	11.5	3.35	8.29
30	EX-9	J1B8X4	9/8/10	2.44	40.4	0.218	0.693	0.112	13.8	4.21	10.3
31	EX-10	J1B8X5	9/8/10	2.38	33.3	0.204	0.605	0.0870	9.89	3.17	8.20
32	EX-11	J1B8X6	9/8/10	2.02	36.7	0.207	0.799	0.0947	11.0	4.10	10.0
33	EX-12	J1B8X7	9/8/10	2.23	41.0	0.217	1.00	0.160	11.9	4.48	12.1

34 Statistical Computations

35		Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
36	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), 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.	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.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
39	Mean	2.30	46.4	0.218	0.901	0.117	10.8	4.15	10.0
40	Standard deviation	0.255	24.0	0.0455	0.434	0.0458	1.36	1.23	1.36
41	95% UCL on mean	2.45	56.8	0.240	1.11	0.136	11.8	4.73	10.8
42	Maximum value	2.81	135	0.337	1.94	0.190	13.8	7.03	12.4
43	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.61 GW and River Protection	320 GW Protection	0.81 GW and River Protection	18.5 GW and River Protection	15.7 GW Protection	22.0 River Protection
44	WAC 173-340 3-PART TEST								
45	95% UCL > Cleanup Limit?	NA	NO	NA	NO	NA	NA	NA	NA
46	> 10% above Cleanup Limit?	NA	NO	NA	NO	NA	NA	NA	NA
47	Any sample > 2X Cleanup Limit?	NA	NO	NA	NO	NA	NA	NA	NA
48	WAC 173-340 Compliance?	Because all values are below background (8.5 mg/kg) the 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 (1.61 mg/kg) the 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 3-part test is not required.	Because all values are below background (18.5 mg/kg) the 3-part test is not required.	Because all values are below background (15.7 mg/kg) the 3-part test is not required.	Because all values are below background (22.0 mg/kg) the 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0600X-CA-V0098
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 6 of 11

1 **600-188 Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample Area	Sample Number	Sample Date	Lead mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL
5	EX-5	J1B8W7	9/8/10	5.07		0.389	373		3.89	0.469	B	1.56	9.93		3.11	53.7		1.94	43.9		7.78
6	Duplicate of J1B8W7	J1B8Y2	9/8/10	4.89		0.334	544		3.34	0.482	B	1.33	9.99		2.67	52.3		1.67	42.9		6.67
7	EX-1	J1B8W6	9/8/10	3.81		0.328	193		3.28	0.265	B	1.31	8.82		2.63	25.3		1.64	23.9		6.57
8	EX-2	J1B8X0	9/8/10	4.30		0.369	344		3.69	0.413	B	1.48	9.30		2.95	56.2		1.85	41.4		7.38
9	EX-3	J1B8W8	9/8/10	3.18		0.366	211		3.66	0.284	B	1.47	10.2		2.93	30.8		1.83	24.3		7.33
10	EX-4	J1B8W9	9/8/10	3.07		0.366	221		3.66	0.300	B	1.47	9.90		2.93	33.2		1.83	26.8		7.33
11	EX-6	J1B8X1	9/8/10	2.75		0.348	203		3.48	0.280	B	1.39	8.45		2.78	21.3		1.74	22.0		6.96
12	EX-7	J1B8X2	9/8/10	3.07		0.332	197		3.32	0.280	B	1.33	9.39		2.66	27.2		1.66	23.6		6.64
13	EX-8	J1B8X3	9/8/10	3.08		0.386	218		3.86	0.325	B	1.54	10.3		3.09	27.2		1.93	23.7		7.72
14	EX-9	J1B8X4	9/8/10	6.29		0.386	238		3.86	0.353	B	1.54	11.1		3.09	39.6		1.93	27.4		7.71
15	EX-10	J1B8X5	9/8/10	3.52		0.333	217		3.33	0.264	B	1.33	9.11		2.66	23.9		1.66	22.8		6.66
16	EX-11	J1B8X6	9/8/10	3.19		0.314	208		3.14	0.283	B	1.25	9.96		2.51	31.2		1.57	28.9		6.27
17	EX-12	J1B8X7	9/8/10	7.73		0.399	237		3.98	0.310	B	1.59	21.7		3.18	35.4		1.99	29.4		7.96

19 **Statistical Computation Input Data**

20	Sample Area	Sample Number	Sample Date	Lead mg/kg	Manganese mg/kg	Molybdenum mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg
22	EX-5	J1B8W7/ J1B8Y2	9/8/10	4.98	459	0.476	9.96	53.0	43.4
23	EX-1	J1B8W6	9/8/10	3.81	193	0.265	8.82	25.3	23.9
24	EX-2	J1B8X0	9/8/10	4.30	344	0.413	9.30	56.2	41.4
25	EX-3	J1B8W8	9/8/10	3.18	211	0.284	10.2	30.8	24.3
26	EX-4	J1B8W9	9/8/10	3.07	221	0.300	9.90	33.2	26.8
27	EX-6	J1B8X1	9/8/10	2.75	203	0.280	8.45	21.3	22.0
28	EX-7	J1B8X2	9/8/10	3.07	197	0.280	9.39	27.2	23.6
29	EX-8	J1B8X3	9/8/10	3.08	218	0.325	10.3	27.2	23.7
30	EX-9	J1B8X4	9/8/10	6.29	238	0.353	11.1	39.6	27.4
31	EX-10	J1B8X5	9/8/10	3.52	217	0.264	9.11	23.9	22.8
32	EX-11	J1B8X6	9/8/10	3.19	208	0.283	10.0	31.2	28.9
33	EX-12	J1B8X7	9/8/10	7.73	237	0.310	21.7	35.4	29.4

34 **Statistical Computations**

35		Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc
36	95% UCL based on	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.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCA Stat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
37	N	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%
39	Mean	4.08	245	0.319	10.7	33.7	26.0
40	Standard deviation	1.53	78.0	0.0650	3.54	11.0	7.09
41	95% UCL on mean	4.87	282	0.350	12.4	40.2	31.3
42	Maximum value	7.73	544	0.482	21.7	56.2	43.9
43	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	10.2 GW & River Protection	512 GW & River Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection
44	WAC 173-340 3-PART TEST						
45	95% UCL > Cleanup Limit?	NA	NO	NO	NO	NA	NA
46	> 10% above Cleanup Limit?	NA	NO	NO	NO	NA	NA
47	Any sample > 2X Cleanup Limit?	NA	NO	NO	NO	NA	NA
48	WAC 173-340 Compliance?	Because all values are below background (10.2 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.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14665

Calc. No. 0600X-CA-V0098
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 7 of 11

Ecology Software (MTCAStat) Results, 600-188 Waste Site Excavation

Arsenic 95% UCL Calculation

DATA	ID
	J1B8W7/
2.20	J1B8Y2
2.24	J1B8W6
1.83	J1B8X0
2.55	J1B8W8
2.81	J1B8W9
2.14	J1B8X1
2.44	J1B8X2
2.36	J1B8X3
2.44	J1B8X4
2.38	J1B8X5
2.02	J1B8X6
2.23	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	2.30
Censored		Lognormal mean	2.30
Detection limit or PQL		Std. devn.	0.255
Method detection limit		Median	2.30
TOTAL	12	Min.	1.83
		Max.	2.81

Lognormal distribution? r-squared is: 0.969
Normal distribution? r-squared is: 0.971
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.45

Barium 95% UCL Calculation

DATA	ID
	J1B8W7/
112	J1B8Y2
35.0	J1B8W6
75.2	J1B8X0
34.8	J1B8W8
39.5	J1B8W9
31.1	J1B8X1
29.0	J1B8X2
37.0	J1B8X3
40.4	J1B8X4
33.3	J1B8X5
38.7	J1B8X6
41.0	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	45.4
Censored		Lognormal mean	45.0
Detection limit or PQL		Std. devn.	24.0
Method detection limit		Median	36.9
TOTAL	12	Min.	29.0
		Max.	112

Lognormal distribution? r-squared is: 0.724
Normal distribution? r-squared is: 0.606
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 58.8

Beryllium 95% UCL Calculation

DATA	ID
	J1B8W7/
0.332	J1B8Y2
0.180	J1B8W6
0.237	J1B8X0
0.184	J1B8W8
0.214	J1B8W9
0.159	J1B8X1
0.153	J1B8X2
0.206	J1B8X3
0.218	J1B8X4
0.204	J1B8X5
0.207	J1B8X6
0.217	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.218
Censored		Lognormal mean	0.218
Detection limit or PQL		Std. devn.	0.0455
Method detection limit		Median	0.207
TOTAL	12	Min.	0.180
		Max.	0.332

Lognormal distribution? r-squared is: 0.801
Normal distribution? r-squared is: 0.743
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.240

Boron 95% UCL Calculation

DATA	ID
	J1B8W7/
1.93	J1B8Y2
0.029	J1B8W6
1.60	J1B8X0
0.724	J1B8W8
0.920	J1B8W9
0.636	J1B8X1
0.710	J1B8X2
0.646	J1B8X3
0.693	J1B8X4
0.605	J1B8X5
0.799	J1B8X6
1.00	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.901
Censored		Lognormal mean	0.896
Detection limit or PQL		Std. devn.	0.434
Method detection limit		Median	0.717
TOTAL	12	Min.	0.535
		Max.	1.93

Lognormal distribution? r-squared is: 0.852
Normal distribution? r-squared is: 0.740
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.11

Cadmium 95% UCL Calculation

DATA	ID
	J1B8W7/
0.186	J1B8Y2
0.0064	J1B8W6
0.172	J1B8X0
0.0981	J1B8W8
0.100	J1B8W9
0.0700	J1B8X1
0.0960	J1B8X2
0.0936	J1B8X3
0.112	J1B8X4
0.0671	J1B8X5
0.0947	J1B8X6
0.190	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.117
Censored		Lognormal mean	0.117
Detection limit or PQL		Std. devn.	0.0408
Method detection limit		Median	0.0971
TOTAL	12	Min.	0.0790
		Max.	0.190

Lognormal distribution? r-squared is: 0.831
Normal distribution? r-squared is: 0.774
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.136

Chromium 95% UCL Calculation

DATA	ID
	J1B8W7/
10.7	J1B8Y2
9.24	J1B8W6
9.87	J1B8X0
12.0	J1B8W8
11.1	J1B8W9
8.96	J1B8X1
10.4	J1B8X2
11.5	J1B8X3
13.8	J1B8X4
9.89	J1B8X5
11.0	J1B8X6
11.9	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	10.8
Censored		Lognormal mean	10.9
Detection limit or PQL		Std. devn.	1.36
Method detection limit		Median	10.9
TOTAL	12	Min.	8.96
		Max.	13.8

Lognormal distribution? r-squared is: 0.976
Normal distribution? r-squared is: 0.958
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.6

Cobalt 95% UCL Calculation

DATA	ID
	J1B8W7/
6.88	J1B8Y2
3.27	J1B8W6
6.26	J1B8X0
3.72	J1B8W8
3.39	J1B8W9
3.07	J1B8X1
3.27	J1B8X2
3.35	J1B8X3
4.21	J1B8X4
3.17	J1B8X5
4.10	J1B8X6
4.48	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	4.15
Censored		Lognormal mean	4.15
Detection limit or PQL		Std. devn.	1.23
Method detection limit		Median	3.86
TOTAL	12	Min.	3.07
		Max.	6.88

Lognormal distribution? r-squared is: 0.883
Normal distribution? r-squared is: 0.795
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.73

Copper 95% UCL Calculation

DATA	ID
	J1B8W7/
12.3	J1B8Y2
9.22	J1B8W6
11.4	J1B8X0
9.63	J1B8W8
10.3	J1B8W9
8.64	J1B8X1
10.2	J1B8X2
8.29	J1B8X3
10.3	J1B8X4
8.20	J1B8X5
10.0	J1B8X6
12.1	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	10.0
Censored		Lognormal mean	10.1
Detection limit or PQL		Std. devn.	1.36
Method detection limit		Median	10.1
TOTAL	12	Min.	8.20
		Max.	12.3

Lognormal distribution? r-squared is: 0.961
Normal distribution? r-squared is: 0.954
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.8

Lead 95% UCL Calculation

DATA	ID
	J1B8W7/
4.98	J1B8Y2
3.81	J1B8W6
4.30	J1B8X0
3.18	J1B8W8
3.07	J1B8W9
2.75	J1B8X1
3.07	J1B8X2
3.08	J1B8X3
6.29	J1B8X4
3.52	J1B8X5
3.19	J1B8X6
7.73	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	4.08
Censored		Lognormal mean	4.08
Detection limit or PQL		Std. devn.	1.53
Method detection limit		Median	3.36
TOTAL	12	Min.	2.75
		Max.	7.73

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.782
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.81

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Quaer

Project 100-HU-2/6 Field Remediation

Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11

Job No. 14855

Calc. No. 0600X-CA-V0098

Checked J. D. Skoglie

Rev. No. 0

Date 01/12/11

Sheet No. 5 of 11

Ecology Software (MTCAStat) Results, 600-188 Waste Site Excavation

Manganese 95% UCL Calculation

DATA	ID
	J1B8W7
459	J1B8Y2
193	J1B8W6
344	J1B8X0
211	J1B8W8
221	J1B8W9
203	J1B8X1
197	J1B8X2
218	J1B8X3
238	J1B8X4
217	J1B8X5
208	J1B8X6
237	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	245
Censored		Lognormal mean	245
Detection limit or PQL		Std. devn.	78.0
Method detection limit		Median	218
TOTAL	12	Min.	193
		Max.	459

Lognormal distribution? r-squared is: 0.705

Normal distribution? r-squared is: 0.829

Recommendations

Reject: BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 282

Molybdenum 95% UCL Calculation

DATA	ID
	J1B8W7
0.476	J1B8Y2
0.265	J1B8W6
0.413	J1B8X0
0.264	J1B8W8
0.300	J1B8W9
0.280	J1B8X1
0.280	J1B8X2
0.325	J1B8X3
0.353	J1B8X4
0.264	J1B8X5
0.283	J1B8X6
0.310	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.319
Censored		Lognormal mean	0.319
Detection limit or PQL		Std. devn.	0.0550
Method detection limit		Median	0.292
TOTAL	12	Min.	0.264
		Max.	0.476

Lognormal distribution? r-squared is: 0.841

Normal distribution? r-squared is: 0.792

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.350

Nickel 95% UCL Calculation

DATA	ID
	J1B8W7
9.88	J1B8Y2
8.82	J1B8W6
9.30	J1B8X0
10.2	J1B8W8
9.60	J1B8W9
8.45	J1B8X1
9.39	J1B8X2
10.3	J1B8X3
11.1	J1B8X4
9.11	J1B8X5
9.86	J1B8X6
21.7	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	10.7
Censored		Lognormal mean	10.6
Detection limit or PQL		Std. devn.	3.54
Method detection limit		Median	9.83
TOTAL	12	Min.	8.45
		Max.	21.7

Lognormal distribution? r-squared is: 0.600

Normal distribution? r-squared is: 0.480

Recommendations

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.4

Vanadium 95% UCL Calculation

DATA	ID
	J1B8W7
53.0	J1B8Y2
25.3	J1B8W6
58.2	J1B8X0
30.8	J1B8W8
33.2	J1B8W9
21.3	J1B8X1
27.2	J1B8X2
27.2	J1B8X3
39.6	J1B8X4
23.9	J1B8X5
31.2	J1B8X6
35.4	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	33.7
Censored		Lognormal mean	33.7
Detection limit or PQL		Std. devn.	11.0
Method detection limit		Median	31.0
TOTAL	12	Min.	21.3
		Max.	58.2

Lognormal distribution? r-squared is: 0.842

Normal distribution? r-squared is: 0.570

Recommendations:

Use lognormal distribution

UCL (Land's method) is 40.2

Zinc 95% UCL Calculation

DATA	ID
	J1B8W7
43.4	J1B8Y2
23.9	J1B8W6
41.4	J1B8X0
24.3	J1B8W8
26.8	J1B8W9
22.0	J1B8X1
23.6	J1B8X2
23.7	J1B8X3
27.4	J1B8X4
22.8	J1B8X5
26.9	J1B8X6
29.4	J1B8X7

Number of samples		Uncensored values	
Uncensored	12	Mean	28.0
Censored		Lognormal mean	28.0
Detection limit or PQL		Std. devn.	7.09
Method detection limit		Median	25.6
TOTAL	12	Min.	22.0
		Max.	43.4

Lognormal distribution? r-squared is: 0.798

Normal distribution? r-squared is: 0.738

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 31.3

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0600X-CA-V0098
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 9 of 11

Duplicate Analysis - 600-188 Excavation

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-5	J1B8W7	9/8/10	9040		3.89	2.10		0.778	88.3		0.389	0.326		0.156	1.91		1.56	0.184		0.156	3410		77.8	11.0		0.156
Duplicate of J1B8W7	J1B8Y2	9/8/10	8510		3.34	2.30		0.667	135		0.334	0.337		0.133	1.94		1.33	0.188		0.133	3490		66.7	10.4		0.133

Analysis:

	TDL	5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	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)
	RPD	6.04%		*41.8%*				2.32%	5.61%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-188 Excavation

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Molybdenum			Nickel		
			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
EX-5	J1B8W7	9/8/10	6.73		1.56	12.1		0.778	21700		15.6	5.07		0.389	4200		58.3	373		3.89	0.469	B	1.56	9.93		3.11
Duplicate of J1B8W7	J1B8Y2	9/8/10	7.03		1.33	12.4		0.667	22600		13.3	4.89		0.334	4330		50.0	544		3.34	0.482	B	1.33	9.99		2.67

Analysis:

	TDL	2	1	5	5	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD		2.45%	4.06%		3.05%	*37.3%*		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Excavation

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			Methylene chloride		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-5	J1B8W7	9/8/10	1990		311	820		1.56	216		38.9	53.7		1.94	43.9		7.78	0.00576	BJ	0.00655
Duplicate of J1B8W7	J1B8Y2	9/8/10	1850		267	711		1.33	198		33.4	52.3		1.67	42.9		6.67	0.00879	B	0.00593

Analysis:

	TDL	400	2	50	2.5	1	0.01
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	
	RPD		14.2%		2.64%	2.30%	
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0600X-CA-V0098
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 10 of 11

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1B8X8	9/8/10	8900		3.97	2.27		0.793	83.9		0.397	0.347		0.159	2.27		1.59	0.203		0.159	3200		79.3	11.3		0.159
Duplicate of J1B8X8	J1B8Y3	9/8/10	8910		3.91	2.29		0.781	81.9		0.391	0.343		0.156	2.28		1.56	0.203		0.156	3300		78.1	11.3		0.156

Analysis:

	TDL	5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	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)
	RPD	0.112%		2.41%				3.08%	0.000%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			iron			Lead			Magnesium			Manganese			Molybdenum			Nickel		
			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	J1B8X8	9/8/10	6.74		1.59	12.9		0.793	21700		15.9	5.70		0.397	4110		59.5	385		3.97	0.475	B	1.59	9.93		3.17
Duplicate of J1B8X8	J1B8Y3	9/8/10	6.51		1.56	12.5		0.781	21900		15.6	5.64		0.391	4170		58.6	383		3.91	0.466	B	1.56	9.67		3.12

Analysis:

	TDL	2	1	5	5	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD		3.15%	0.917%		1.45%	0.521%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - motor oil			Benzo(a)anthracene			Benzo(a)pyrene		
			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	J1B8X8	9/8/10	2180		317	499		1.59	175		39.7	48.6		1.98	43.9		7.93	16.0		10.0	0.00146	J	0.00314	0.00218	J	0.00314
Duplicate of J1B8X8	J1B8Y3	9/8/10	2050		312	672		1.56	180		39.1	47.4		1.95	43.0		7.81	13.4		10.2	0.00179	J	0.00326	0.00336		0.00326

Analysis:

	TDL	400	2	50	2.5	1	5	0.015	0.015
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)		
	RPD	6.15%	29.5%		2.50%	2.07%			
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Phenanthrene			Pyrene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1B8X8	9/8/10	0.00311	J	0.00314	0.00363		0.00314	0.00127	J	0.00314	0.00376		0.00314	0.00163	J	0.00314
Duplicate of J1B8X8	J1B8Y3	9/8/10	0.00478		0.00326	0.00530		0.00326	0.00204	J	0.00326	0.00468		0.00326	0.00333		0.00326

Analysis:

	TDL	0.015	0.015	0.015	0.015	0.015
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?		No-Stop (acceptable)		No-Stop (acceptable)	
	RPD					
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-IU-2/6 Field Remediation
Subject 600-188 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0600X-CA-V0098
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 11 of 11

Duplicate Analysis - 600-188 Overburden

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-1	J1B8Y4	9/8/10	8480		3.35	2.42		0.670	77.3		0.335	0.335		0.134	2.13		1.34	0.194		0.134	3280		67.0	10.7		0.134
Duplicate of J1B8Y4	J1B8Y8	9/8/10	9450		4.48	2.75		0.896	89.2		0.448	0.327		0.179	2.16		1.79	0.197		0.179	3320		89.6	11.4		0.179

Analysis:

	TDL	5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	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)
	RPD	10.8%		14.3%				1.21%	6.33%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Molybdenum			Nickel		
			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
OB-1	J1B8Y4	9/8/10	6.20		1.34	12.0		0.670	21500		13.4	5.67		0.335	4130		50.2	352		3.35	0.460	B	1.34	9.64		2.68
Duplicate of J1B8Y4	J1B8Y8	9/8/10	6.74		1.79	12.8		0.896	21600		17.9	6.47		0.448	4020		67.2	373		4.48	0.525	B	1.79	10.0		3.58

Analysis:

	TDL	2	1	5	5	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD		6.45%	0.464%		2.70%	5.79%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - motor oil			Benzo(a)anthracene			Benzo(a)pyrene		
			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
OB-1	J1B8Y4	9/8/10	2000		268	656		1.34	170		33.5	46.8		1.67	41.6		6.7	29.3		10.1	0.00579		0.00321	0.00675		0.00321
Duplicate of J1B8Y4	J1B8Y8	9/8/10	2100		358	1050		1.79	182		44.8	51.4		2.24	46.7		8.96	18.1		10.0	0.00793		0.00327	0.00521		0.00327

Analysis:

	TDL	400	2	50	2.5	1	5	0.015	0.015
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		46.2%		9.37%	11.6%			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Yes - assess further	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Dibenz[a,h]anthracene			Fluoranthene			Indeno(1,2,3-cd)pyrene			Phenanthrene		
			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
OB-1	J1B8Y4	9/8/10	0.0178		0.00321	0.0100		0.00321	0.00786		0.00321	0.00888		0.00321	0.00101	J	0.00321	0.0300		0.00321	0.00146	J	0.00321	0.00457		0.00321
Duplicate of J1B8Y4	J1B8Y8	9/8/10	0.0248		0.00327	0.00894		0.00327	0.00852		0.00327	0.0227		0.00327	0.000817	J	0.00327	0.0689		0.00327	0.00487		0.00327	0.00801		0.00327

Analysis:

	TDL	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)		No-Stop (acceptable)		No-Stop (acceptable)
	RPD								
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Yes - assess further	No - acceptable	No - acceptable

Duplicate Analysis - 600-188 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Pyrene		
			mg/kg	Q	PQL
OB-1	J1B8Y4	9/8/10	0.0148		0.00321
Duplicate of J1B8Y4	J1B8Y8	9/8/10	0.0269		0.00327

Analysis:

	TDL	0.015
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

Attachment 1. 600-188 Waste Site 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
EX-5	J1B8W7	9/8/10	9040		3.89	0.239	B	0.467	2.10		0.778	88.3		0.389	0.326		0.156
Duplicate of J1B8W7	J1B8Y2	9/8/10	8510		3.34	0.400	U	0.400	2.30		0.667	135		0.334	0.337		0.133
EX-1	J1B8W6	9/8/10	4940		3.28	0.394	U	0.394	2.24		0.657	35.0		0.328	0.180		0.131
EX-2	J1B8X0	9/8/10	7690		3.69	0.443	U	0.443	1.83		0.738	75.2		0.369	0.287		0.148
EX-3	J1B8W8	9/8/10	5050		3.66	0.440	U	0.440	2.55		0.733	34.8		0.366	0.184		0.147
EX-4	J1B8W9	9/8/10	5560		3.66	0.440	U	0.440	2.81		0.733	39.5		0.366	0.214		0.147
EX-6	J1B8X1	9/8/10	4640		3.48	0.417	U	0.417	2.14		0.696	31.1		0.348	0.189		0.139
EX-7	J1B8X2	9/8/10	4900		3.32	0.204	B	0.399	2.44		0.664	29.0		0.332	0.183		0.133
EX-8	J1B8X3	9/8/10	4890		3.86	0.463	U	0.463	2.36		0.772	37.0		0.386	0.206		0.154
EX-9	J1B8X4	9/8/10	5080		3.86	0.463	U	0.463	2.44		0.771	40.4		0.386	0.218		0.154
EX-10	J1B8X5	9/8/10	4700		3.33	0.233	B	0.400	2.38		0.666	33.3		0.333	0.204		0.133
EX-11	J1B8X6	9/8/10	5430		3.14	0.376	U	0.376	2.02		0.627	36.7		0.314	0.207		0.125
EX-12	J1B8X7	9/8/10	5770		3.98	0.478	U	0.478	2.23		0.796	41.0		0.398	0.217		0.159
SPA-1	J1B8X8	9/8/10	8900		3.97	0.476	U	0.476	2.27		0.793	83.9		0.397	0.347		0.159
Duplicate of J1B8X8	J1B8Y3	9/8/10	8910		3.91	0.469	U	0.469	2.29		0.781	81.9		0.391	0.343		0.156
SPA-2	J1B8X9	9/8/10	8690		3.96	0.244	B	0.475	2.35		0.792	78.3		0.396	0.328		0.158
SPA-3	J1B8Y0	9/8/10	8410		4.36	0.523	U	0.523	2.15		0.872	77.9		0.436	0.324		0.174
SPA-4	J1B8Y1	9/8/10	8380		3.97	0.296	B	0.477	2.58		0.794	77.9		0.397	0.331		0.159
OB-1	J1B8Y4	9/8/10	8480		3.35	0.402	U	0.402	2.42		0.670	77.3		0.335	0.335		0.134
Duplicate of J1B8Y4	J1B8Y8	9/8/10	9450		4.48	0.537	UJ	0.537	2.75		0.896	89.2		0.448	0.327		0.179
OB-2	J1B8Y5	9/8/10	9290		3.52	0.423	U	0.423	2.42		0.705	83.0		0.352	0.375		0.141
OB-3	J1B8Y6	9/8/10	8620		3.56	0.427	UJ	0.427	2.61		0.712	84.7		0.356	0.307		0.142
OB-4	J1B8Y7	9/8/10	8790		3.36	0.299	JB	0.403	2.66		0.672	85.0		0.336	0.307		0.134
Equipment blank	J1B8Y9	9/8/10	183		3.52	0.423	UJ	0.423	0.216	B	0.704	3.21		0.352	0.0660	B	0.141

Note: Gray cells indicate not applicable.

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

D = analyte reported from a dilution

HEIS = Hanford Environmental Information System

J = estimated result

PQL = practical quantitation limit

Q = qualifier

U = undetected

Attachment	1	Sheet No.	1 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site 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
EX-5	J1B8W7	9/8/10	1.91		1.56	0.184		0.156	3410		77.8	11.0		0.156	6.73		1.56
Duplicate of J1B8W7	J1B8Y2	9/8/10	1.94		1.33	0.188		0.133	3490		66.7	10.4		0.133	7.03		1.33
EX-1	J1B8W6	9/8/10	0.629	B	1.31	0.0864	B	0.131	4330		65.7	9.24		0.131	3.27		1.31
EX-2	J1B8X0	9/8/10	1.63		1.48	0.172		0.148	3350		73.8	9.67		0.148	6.26		1.48
EX-3	J1B8W8	9/8/10	0.72	B	1.47	0.0981	B	0.147	5110		73.3	12.0		0.147	3.72		1.47
EX-4	J1B8W9	9/8/10	0.92	B	1.47	0.109	B	0.147	6860		73.3	11.1		0.147	3.99		1.47
EX-6	J1B8X1	9/8/10	0.535	B	1.39	0.0790	B	0.139	4000		69.6	8.96		0.139	3.07		1.39
EX-7	J1B8X2	9/8/10	0.710	B	1.33	0.0960	B	0.133	6990		66.4	10.4		0.133	3.27		1.33
EX-8	J1B8X3	9/8/10	0.646	B	1.54	0.0936	B	0.154	6050		77.2	11.5		0.154	3.35		1.54
EX-9	J1B8X4	9/8/10	0.693	B	1.54	0.112	B	0.154	4570		77.1	13.8		0.154	4.21		1.54
EX-10	J1B8X5	9/8/10	0.605	B	1.33	0.0870	B	0.133	4670		66.6	9.89		0.133	3.17		1.33
EX-11	J1B8X6	9/8/10	0.799	B	1.25	0.0947	B	0.125	4310		62.7	11.0		0.125	4.10		1.25
EX-12	J1B8X7	9/8/10	1.00	B	1.59	0.190		0.159	4470		79.6	11.9		0.159	4.48		1.59
SPA-1	J1B8X8	9/8/10	2.27		1.59	0.203		0.159	3200		79.3	11.3		0.159	6.74		1.59
Duplicate of J1B8X8	J1B8Y3	9/8/10	2.28		1.56	0.203		0.156	3300		78.1	11.3		0.156	6.51		1.56
SPA-2	J1B8X9	9/8/10	2.14		1.58	0.186		0.158	3330		79.2	11.5		0.158	6.29		1.58
SPA-3	J1B8Y0	9/8/10	2.16		1.74	0.200		0.174	3480		87.2	11.1		0.174	6.60		1.74
SPA-4	J1B8Y1	9/8/10	2.15		1.59	0.192		0.159	3660		79.4	11.4		0.159	6.07		1.59
OB-1	J1B8Y4	9/8/10	2.13		1.34	0.194		0.134	3280		67.0	10.7		0.134	6.20		1.34
Duplicate of J1B8Y4	J1B8Y8	9/8/10	2.16		1.79	0.197		0.179	3320		89.6	11.4		0.179	6.74		1.79
OB-2	J1B8Y5	9/8/10	2.23		1.41	0.210		0.141	3310		70.5	13.8		0.141	6.75		1.41
OB-3	J1B8Y6	9/8/10	1.90		1.42	0.226		0.142	3290		71.2	11.3		0.142	6.56		1.42
OB-4	J1B8Y7	9/8/10	2.00		1.34	0.203		0.134	3140		67.2	11.1		0.134	6.40		1.34
Equipment blank	J1B8Y9	9/8/10	1.41	U	1.41	0.141	U	0.141	36.7	BUJ	70.4	0.162		0.141	1.41	U	1.41

Attachment	1	Sheet No.	2 of 14
Originator	T. E. Queen	Date	12/29/10
Checked	J. D. Skoglie	Date	12/29/10
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Copper			Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-5	J1B8W7	9/8/10	12.1		0.778	21700		15.6	5.07		0.389	4200		58.3	373		3.89
Duplicate of J1B8W7	J1B8Y2	9/8/10	12.4		0.667	22600		13.3	4.89		0.334	4330		50.0	544		3.34
EX-1	J1B8W6	9/8/10	9.22		0.657	10900		13.1	3.81		0.328	3380		49.3	193		3.28
EX-2	J1B8X0	9/8/10	11.4		0.738	21100		14.8	4.30		0.369	3930		55.4	344		3.69
EX-3	J1B8W8	9/8/10	9.63		0.733	13800		14.7	3.18		0.366	3710		54.9	211		3.66
EX-4	J1B8W9	9/8/10	10.3		0.733	13800		14.7	3.07		0.366	3780		55.0	221		3.66
EX-6	J1B8X1	9/8/10	8.64		0.696	9880		13.9	2.75		0.348	3260		52.2	203		3.48
EX-7	J1B8X2	9/8/10	10.2		0.664	12400		13.3	3.07		0.332	3620		49.8	197		3.32
EX-8	J1B8X3	9/8/10	8.29		0.772	12300		15.4	3.08		0.386	3630		57.9	218		3.86
EX-9	J1B8X4	9/8/10	10.3		0.771	17300		15.4	6.29		0.386	3660		57.8	238		3.86
EX-10	J1B8X5	9/8/10	8.20		0.666	11100		13.3	3.52		0.333	3480		49.9	217		3.33
EX-11	J1B8X6	9/8/10	10.0		0.627	14000		12.5	3.19		0.314	4030		47.1	208		3.14
EX-12	J1B8X7	9/8/10	12.1		0.796	15800		15.9	7.73		0.398	4070		59.7	237		3.98
SPA-1	J1B8X8	9/8/10	12.9		0.793	21700		15.9	5.70		0.397	4110		59.5	385		3.97
Duplicate of J1B8X8	J1B8Y3	9/8/10	12.5		0.781	21900		15.6	5.64		0.391	4170		58.6	383		3.91
SPA-2	J1B8X9	9/8/10	12.4		0.792	21200		15.8	5.78		0.396	4110		59.4	362		3.96
SPA-3	J1B8Y0	9/8/10	12.4		0.872	21700		17.4	5.53		0.436	4170		65.4	358		4.36
SPA-4	J1B8Y1	9/8/10	12.6		0.794	22700		15.9	5.84		0.397	4340		59.6	355		3.97
OB-1	J1B8Y4	9/8/10	12.0		0.670	21500		13.4	5.67		0.335	4130		50.2	352		3.35
Duplicate of J1B8Y4	J1B8Y8	9/8/10	12.8		0.896	21600		17.9	6.47		0.448	4020		67.2	373		4.48
OB-2	J1B8Y5	9/8/10	12.9		0.705	23200		14.1	5.89		0.352	4400		52.9	383		3.52
OB-3	J1B8Y6	9/8/10	13.5		0.712	21000		14.2	8.45		0.356	4140		53.4	377		3.56
OB-4	J1B8Y7	9/8/10	12.5		0.672	20500		13.4	6.34		0.336	3870		50.4	363		3.36
Equipment blank	J1B8Y9	9/8/10	0.704	U	0.704	1670		14.1	0.969		0.352	26.3	B	52.8	34.9		3.52

Attachment	1	Sheet No.	3 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-5	J1B8W7	9/8/10	0.0257	U	0.0257	0.469	B	1.56	9.93		3.11	1990		311	0.233	U	0.233
Duplicate of J1B8W7	J1B8Y2	9/8/10	0.0272	U	0.0272	0.482	B	1.33	9.99		2.67	1850		267	0.219		0.200
EX-1	J1B8W6	9/8/10	0.0271	U	0.0271	0.265	B	1.31	8.82		2.63	843		263	0.197	U	0.197
EX-2	J1B8X0	9/8/10	0.0278	U	0.0278	0.413	B	1.48	9.30		2.95	1840		295	0.222	U	0.222
EX-3	J1B8W8	9/8/10	0.0264	U	0.0264	0.284	B	1.47	10.2		2.93	882		293	0.220	U	0.220
EX-4	J1B8W9	9/8/10	0.0250	U	0.0250	0.300	B	1.47	9.90		2.93	1000		293	0.220	U	0.220
EX-6	J1B8X1	9/8/10	0.0286	U	0.0286	0.280	B	1.39	8.45		2.78	801		278	0.209	U	0.209
EX-7	J1B8X2	9/8/10	0.0267	U	0.0267	0.280	B	1.33	9.39		2.66	804		266	0.204		0.199
EX-8	J1B8X3	9/8/10	0.0270	U	0.0270	0.325	B	1.54	10.3		3.09	858		309	0.232	U	0.232
EX-9	J1B8X4	9/8/10	0.0278	U	0.0278	0.353	B	1.54	11.1		3.09	904		309	0.231	U	0.231
EX-10	J1B8X5	9/8/10	0.0268	U	0.0268	0.264	B	1.33	9.11		2.66	783		266	0.200	U	0.200
EX-11	J1B8X6	9/8/10	0.0261	U	0.0261	0.283	B	1.25	9.96		2.51	893		251	0.188	U	0.188
EX-12	J1B8X7	9/8/10	0.0248	U	0.0248	0.310	B	1.59	21.7		3.18	961		318	0.239	U	0.239
SPA-1	J1B8X8	9/8/10	0.0258	U	0.0258	0.475	B	1.59	9.93		3.17	2180		317	0.238	U	0.238
Duplicate of J1B8X8	J1B8Y3	9/8/10	0.0273	U	0.0273	0.466	B	1.56	9.67		3.12	2050		312	0.279		0.234
SPA-2	J1B8X9	9/8/10	0.0273	U	0.0273	0.441	B	1.58	10.6		3.17	2030		317	0.284		0.238
SPA-3	J1B8Y0	9/8/10	0.0281	U	0.0281	0.457	B	1.74	10.3		3.49	1940		349	0.262	U	0.262
SPA-4	J1B8Y1	9/8/10	0.0266	U	0.0266	0.562	B	1.59	11.0		3.18	1860		318	0.238	U	0.238
OB-1	J1B8Y4	9/8/10	0.0269	U	0.0269	0.460	B	1.34	9.64		2.68	2000		268	0.201	U	0.201
Duplicate of J1B8Y4	J1B8Y8	9/8/10	0.0287	U	0.0287	0.525	B	1.79	10.0		3.58	2100		358	0.269	U	0.269
OB-2	J1B8Y5	9/8/10	0.0247	U	0.0247	0.519	B	1.41	11.8		2.82	2150		282	0.218		0.211
OB-3	J1B8Y6	9/8/10	0.0239	U	0.0239	0.512	B	1.42	9.95		2.85	1890		285	0.213	U	0.213
OB-4	J1B8Y7	9/8/10	0.0259	U	0.0259	0.553	B	1.34	10.0		2.69	1960		269	0.201	U	0.201
Equipment blank	J1B8Y9	9/8/10	0.0237	U	0.0237	1.41	U	1.41	2.82	U	2.82	37.2	B	282	0.211	U	0.211

Attachment	1	Sheet No.	4 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-5	J1B8W7	9/8/10	820		1.56	0.156	U	0.156	216		38.9	53.7		1.94	43.9		7.78
Duplicate of J1B8W7	J1B8Y2	9/8/10	711		1.33	0.133	U	0.133	198		33.4	52.3		1.67	42.9		6.67
EX-1	J1B8W6	9/8/10	369		1.31	0.131	U	0.131	113		32.8	25.3		1.64	23.9		6.57
EX-2	J1B8X0	9/8/10	674		1.48	0.148	U	0.148	190		36.9	56.2		1.85	41.4		7.38
EX-3	J1B8W8	9/8/10	434		1.47	0.147	U	0.147	117		36.6	30.8		1.83	24.3		7.33
EX-4	J1B8W9	9/8/10	350		1.47	0.147	U	0.147	149		36.6	33.2		1.83	26.8		7.33
EX-6	J1B8X1	9/8/10	365		1.39	0.139	U	0.139	97		34.8	21.3		1.74	22.0		6.96
EX-7	J1B8X2	9/8/10	371		1.33	0.133	U	0.133	114		33.2	27.2		1.66	23.6		6.64
EX-8	J1B8X3	9/8/10	414		1.54	0.154	U	0.154	123		38.6	27.2		1.93	23.7		7.72
EX-9	J1B8X4	9/8/10	446		1.54	0.154	U	0.154	135		38.6	39.6		1.93	27.4		7.71
EX-10	J1B8X5	9/8/10	399		1.33	0.133	U	0.133	108		33.3	23.9		1.66	22.8		6.66
EX-11	J1B8X6	9/8/10	241		1.25	0.125	U	0.125	137		31.4	31.2		1.57	26.9		6.27
EX-12	J1B8X7	9/8/10	355		1.59	0.159	U	0.159	138		39.8	35.4		1.99	29.4		7.96
SPA-1	J1B8X8	9/8/10	499		1.59	0.159	U	0.159	175		39.7	48.6		1.98	43.9		7.93
Duplicate of J1B8X8	J1B8Y3	9/8/10	672		1.56	0.156	U	0.156	180		39.1	47.4		1.95	43.0		7.81
SPA-2	J1B8X9	9/8/10	787		1.58	0.158	U	0.158	188		39.6	47.5		1.98	41.9		7.92
SPA-3	J1B8Y0	9/8/10	270		1.74	0.174	U	0.174	185		43.6	49.6		2.18	41.6		8.72
SPA-4	J1B8Y1	9/8/10	742		1.59	0.159	U	0.159	181		39.7	49.2		1.99	41.4		7.94
OB-1	J1B8Y4	9/8/10	656		1.34	0.134	U	0.134	170		33.5	46.8		1.67	41.6		6.70
Duplicate of J1B8Y4	J1B8Y8	9/8/10	1050		1.79	0.179	U	0.179	182		44.8	51.4		2.24	46.7		8.96
OB-2	J1B8Y5	9/8/10	799		1.41	0.141	U	0.141	180		35.2	50.5		1.76	45.2		7.05
OB-3	J1B8Y6	9/8/10	734		1.42	0.142	U	0.142	170		35.6	49.7		1.78	47.2		7.12
OB-4	J1B8Y7	9/8/10	773		1.34	0.134	U	0.134	173		33.6	49.8		1.68	48.7		6.72
Equipment blank	J1B8Y9	9/8/10	165		1.41	0.141	U	0.141	35.2	U	35.2	0.684	B	1.76	1.88	B	7.04

Attachment	1	Sheet No.	5 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (TPH).

Sample Location	HEIS Number	Sample Date	TPH - diesel range			TPH - motor oil (high boiling)		
			ug/kg	Q	PQL	ug/kg	Q	PQL
EX-5	J1B8W7	9/8/10	3330	U	3330	9980	U	9980
Duplicate of J1B8W7	J1B8Y2	9/8/10	3410	U	3410	9550	J	10200
EX-1	J1B8W6	9/8/10	3380	U	3380	10100	U	10100
EX-2	J1B8X0	9/8/10	3360	U	3360	10100	U	10100
EX-3	J1B8W8	9/8/10	3280	U	3280	9850	U	9850
EX-4	J1B8W9	9/8/10	3300	U	3300	9910	U	9910
EX-6	J1B8X1	9/8/10	3150	U	3150	9450	U	9450
EX-7	J1B8X2	9/8/10	3160	U	3160	9470	U	9470
EX-8	J1B8X3	9/8/10	3320	U	3320	9960	U	9960
EX-9	J1B8X4	9/8/10	3320	U	3320	9950	U	9950
EX-10	J1B8X5	9/8/10	3310	U	3310	10300		9920
EX-11	J1B8X6	9/8/10	3260	U	3260	4880	J	9780
EX-12	J1B8X7	9/8/10	6700	U	6700	116000	D	20100
SPA-1	J1B8X8	9/8/10	3340	U	3340	16000		10000
Duplicate of J1B8X8	J1B8Y3	9/8/10	3410	U	3410	13400		10200
SPA-2	J1B8X9	9/8/10	3320	U	3320	21200		9980
SPA-3	J1B8Y0	9/8/10	3420	U	3420	19400		10200
SPA-4	J1B8Y1	9/8/10	3400	U	3400	36900		10200
OB-1	J1B8Y4	9/8/10	3350	U	3350	29300		10100
Duplicate of J1B8Y4	J1B8Y8	9/8/10	3330	U	3330	18100	J	10000
OB-2	J1B8Y5	9/8/10	3190	U	3190	39400		9570
OB-3	J1B8Y6	9/8/10	3350	U	3350	10400	J	10100
OB-4	J1B8Y7	9/8/10	3260	U	3260	27400	J	9770
Equipment blank	J1B8Y9	9/8/10						

Attachment	1	Sheet No.	6 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1B8W7, EX-5			J1B8Y2, EX-5 Dup			J1B8W6, EX-1			J1B8X0, EX-2			J1B8W8, EX-3		
		9/8/10			9/8/10			9/8/10			9/8/10			9/8/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Acenaphthylene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Anthracene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Benzo(a)anthracene	PAH	3.31	U	3.31	3.40	U	3,40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Benzo(a)pyrene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Benzo(b)fluoranthene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Benzo(ghi)perylene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Benzo(k)fluoranthene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Chrysene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Dibenz[a,h]anthracene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Fluoranthene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Fluorene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Indeno(1,2,3-cd)pyrene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Naphthalene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Phenanthrene	PAH	3.31	U	3.31	0.901	J	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
Pyrene	PAH	3.31	U	3.31	3.40	U	3.40	3.36	U	3.36	3.35	U	3.35	3.29	U	3.29
1,1,1-Trichloroethane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,1,2,2-Tetrachloroethane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,1,2-Trichloroethane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,1-Dichloroethane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,1-Dichloroethene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,2-Dichloroethane	VOA	6.55	U	6.55	5.93	U	5.93	5.39	U	5.39	4.93	U	4.93	4.81	U	4.81
1,2-Dichloroethene(Total)	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
1,2-Dichloropropane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
2-Butanone	VOA	13.1	U	13.1	11.9	U	11.9	10.8	U	10.8	9.86	U	9.86	9.62	U	9.62
2-Hexanone	VOA	13.1	U	13.1	11.9	U	11.9	10.8	U	10.8	9.86	U	9.86	9.62	U	9.62
4-Methyl-2-Pentanone	VOA	13.1	U	13.1	11.9	U	11.9	10.8	U	10.8	9.86	U	9.86	9.62	U	9.62
Acetone	VOA	13.1	U	13.1	11.9	U	11.9	10.8	U	10.8	9.86	U	9.86	8.49	BJ	9.62
Benzene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Bromodichloromethane	VOA	6.55	U	6.55	5.93	U	5.93	5.39	U	5.39	4.93	U	4.93	4.81	U	4.81
Bromoform	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Bromomethane	VOA	10.9	U	10.9	9.88	U	9.88	8.99	U	8.99	8.22	U	8.22	8.01	U	8.01
Carbon disulfide	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Carbon tetrachloride	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Chlorobenzene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Chloroethane	VOA	10.9	U	10.9	9.88	U	9.88	8.99	U	8.99	8.22	U	8.22	8.01	U	8.01
Chloroform	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Chloromethane	VOA	10.9	U	10.9	9.88	U	9.88	8.99	U	8.99	8.22	U	8.22	8.01	U	8.01
cis-1,2-Dichloroethylene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
cis-1,3-Dichloropropene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Dibromochloromethane	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Ethylbenzene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Methylenechloride	VOA	5.76	BJ	6.55	8.79	B	5.93	4.36	BJ	5.39	4.44	BJ	4.39	4.71	BJ	4.81
Styrene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Tetrachloroethene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Toluene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
trans-1,2-Dichloroethylene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
trans-1,3-Dichloropropene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Trichloroethene	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01
Vinyl chloride	VOA	10.9	U	10.9	9.88	U	9.88	8.99	U	8.99	8.22	U	8.22	8.01	U	8.01
Xylenes (total)	VOA	5.46	U	5.46	4.94	U	4.94	4.49	U	4.49	4.11	U	4.11	4.01	U	4.01

Attachment	1	Sheet No.	7 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1B8W9, EX-4			J1B8X1, EX-6			J1B8X2, EX-7			J1B8X3, EX-8			J1B8X4, EX-9		
		9/8/10			9/8/10			9/8/10			9/8/10			9/8/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Acenaphthylene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Anthracene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Benzo(a)anthracene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Benzo(a)pyrene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Benzo(b)fluoranthene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Benzo(ghi)perylene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Benzo(k)fluoranthene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Chrysene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Dibenz[a,h]anthracene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Fluoranthene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Fluorene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Indeno(1,2,3-cd)pyrene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Naphthalene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Phenanthrene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
Pyrene	PAH	3.29	U	3.29	3.36	U	3.36	3.17	U	3.17	3.31	U	3.31	3.36	U	3.36
1,1,1-Trichloroethane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,1,2,2-Tetrachloroethane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,1,2-Trichloroethane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,1-Dichloroethane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,1-Dichloroethene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,2-Dichloroethane	VOA	6.41	U	6.41	5.97	U	5.97	5.31	U	5.31	6.12	U	6.12	6.11	U	6.11
1,2-Dichloroethene(Total)	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
1,2-Dichloropropane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
2-Butanone	VOA	12.8	U	12.8	11.9	U	11.9	10.6	U	10.6	12.2	U	12.2	12.2	U	12.2
2-Hexanone	VOA	12.8	U	12.8	11.9	U	11.9	10.6	U	10.6	12.2	U	12.2	12.2	U	12.2
4-Methyl-2-Pentanone	VOA	12.8	U	12.8	11.9	U	11.9	10.6	U	10.6	12.2	U	12.2	12.2	U	12.2
Acetone	VOA	11.3	BJ	12.8	11.9	U	11.9	10.6	U	10.6	12.2	U	12.2	12.2	U	12.2
Benzene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Bromodichloromethane	VOA	6.41	U	6.41	5.97	U	5.97	5.31	U	5.31	6.12	U	6.12	6.11	U	6.11
Bromoform	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Bromomethane	VOA	10.7	U	10.7	9.96	U	9.96	8.86	U	8.86	10.2	U	10.2	10.2	U	10.2
Carbon disulfide	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Carbon tetrachloride	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Chlorobenzene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Chloroethane	VOA	10.7	U	10.7	9.96	U	9.96	8.86	U	8.86	10.2	U	10.2	10.2	U	10.2
Chloroform	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Chloromethane	VOA	10.7	U	10.7	9.96	U	9.96	8.86	U	8.86	10.2	U	10.2	10.2	U	10.2
cis-1,2-Dichloroethylene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
cis-1,3-Dichloropropene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Dibromochloromethane	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Ethylbenzene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Methylenechloride	VOA	6.83	B	6.41	5.97	U	5.97	5.31	U	5.31	6.12	U	6.12	6.11	U	6.11
Styrene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Tetrachloroethene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Toluene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
trans-1,2-Dichloroethylene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
trans-1,3-Dichloropropene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Trichloroethene	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09
Vinyl chloride	VOA	10.7	U	10.7	9.96	U	9.96	8.86	U	8.86	10.2	U	10.2	10.2	U	10.2
Xylenes (total)	VOA	5.34	U	5.34	4.98	U	4.98	4.43	U	4.43	5.10	U	5.10	5.09	U	5.09

Attachment	1	Sheet No.	8 of 14
Originator	T. E. Queen	Date	1/6/11
Checked	J. D. Skoglie	Date	1/6/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1B8X5, EX-10			J1B8X6, EX-11			J1B8X7, EX-12			J1B8X8, SPA-1			J1B8Y3, SPA-1 Dup		
		9/8/10			9/8/10			9/8/10			9/8/10			9/8/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	1.62	J	3.14	3.26	U	3.26
Acenaphthylene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	4.86		3.26
Anthracene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	3.26	U	3.26
Benzo(a)anthracene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	1.46	J	3.14	1.79	J	3.26
Benzo(a)pyrene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	2.18	J	3.14	3.36		3.26
Benzo(b)fluoranthene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.11	J	3.14	4.78		3.26
Benzo(ghi)perylene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.63		3.14	5.30		3.26
Benzo(k)fluoranthene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	1.27	J	3.14	2.04	J	3.26
Chrysene	PAH	3.29	U	3.29	3.27	U	3.27	3.09	J	3.23	3.14	U	3.14	2.28	J	3.26
Dibenz[a,h]anthracene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	3.26	U	3.26
Fluoranthene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	3.26	U	3.26
Fluorene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	0.962	J	3.26
Indeno(1,2,3-cd)pyrene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	2.63	J	3.26
Naphthalene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.14	U	3.14	3.26	U	3.26
Phenanthrene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	3.76		3.14	4.68		3.26
Pyrene	PAH	3.29	U	3.29	3.27	U	3.27	3.23	U	3.23	1.63	J	3.14	3.33		3.26
1,1,1-Trichloroethane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,1,2,2-Tetrachloroethane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,1,2-Trichloroethane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,1-Dichloroethane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,1-Dichloroethene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,2-Dichloroethane	VOA	6.20	U	6.20	5.65	U	5.65	5.88	U	5.88	6.31	U	6.31	5.84	U	5.84
1,2-Dichloroethene(Total)	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
1,2-Dichloropropane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
2-Butanone	VOA	12.4	U	12.4	11.3	U	11.3	11.8	U	11.8	12.6	U	12.6	11.7	U	11.7
2-Hexanone	VOA	12.4	U	12.4	11.3	U	11.3	11.8	U	11.8	12.6	U	12.6	11.7	U	11.7
4-Methyl-2-Pentanone	VOA	12.4	U	12.4	11.3	U	11.3	11.8	U	11.8	12.6	U	12.6	11.7	U	11.7
Acetone	VOA	12.4	U	12.4	11.3	U	11.3	11.8	U	11.8	12.6	U	12.6	11.7	U	11.7
Benzene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Bromodichloromethane	VOA	6.20	U	6.20	5.65	U	5.65	5.88	U	5.88	6.31	U	6.31	5.84	U	5.84
Bromoform	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Bromomethane	VOA	10.3	U	10.3	9.41	U	9.41	9.80	U	9.80	10.5	U	10.5	9.73	U	9.73
Carbon disulfide	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Carbon tetrachloride	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Chlorobenzene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Chloroethane	VOA	10.3	U	10.3	9.41	U	9.41	9.80	U	9.80	10.5	U	10.5	9.73	U	9.73
Chloroform	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Chloromethane	VOA	10.3	U	10.3	9.41	U	9.41	9.80	U	9.80	10.5	U	10.5	9.73	U	9.73
cis-1,2-Dichloroethylene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
cis-1,3-Dichloropropene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Dibromochloromethane	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Ethylbenzene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Methylenechloride	VOA	6.20	U	6.20	5.65	U	5.65	5.88	U	5.88	6.31	U	6.31	7.27	B	5.84
Styrene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Tetrachloroethene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Toluene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
trans-1,2-Dichloroethylene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
trans-1,3-Dichloropropene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Trichloroethene	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86
Vinyl chloride	VOA	10.3	U	10.3	9.41	U	9.41	9.80	U	9.80	10.5	U	10.5	9.73	U	9.73
Xylenes (total)	VOA	5.16	U	5.16	4.71	U	4.71	4.90	U	4.90	5.26	U	5.26	4.86	U	4.86

Attachment	1	Sheet No.	9 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1B8X9, SPA-2			J1B8Y0, SPA-3			J1B8Y1, SPA-4			J1B8Y4, OB-1			J1B8Y8, OB-1 Dup		
		9/8/10			9/8/10			9/8/10			9/8/10			9/8/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	57.6		3.30	3.41	U	3.41	3.24	U	3.24	3.21	U	3.21	1.24	J	3.27
Acenaphthylene	PAH	31.4		3.30	3.41	U	3.41	3.24	U	3.24	3.21	U	3.21	3.27	U	3.27
Anthracene	PAH	3.30	U	3.30	3.41	U	3.41	3.24	U	3.24	3.21	U	3.21	3.27	U	3.27
Benzo(a)anthracene	PAH	29.5		3.30	1.04	J	3.41	3.52		3.24	5.79		5.79	7.93		3.27
Benzo(a)pyrene	PAH	55.3		3.30	3.19	J	3.41	12.0		3.24	6.75		6.75	5.21		3.27
Benzo(b)fluoranthene	PAH	99.2		3.30	4.29		3.41	12.9		3.24	17.8		17.8	24.8		3.27
Benzo(ghi)perylene	PAH	103		3.30	4.60		3.41	13.5		3.24	10.0		10.0	8.94		3.27
Benzo(k)fluoranthene	PAH	44.2		3.30	1.93	J	3.41	6.17		3.24	7.86		7.86	8.52		3.27
Chrysene	PAH	42.4		3.30	3.41	U	3.41	4.49		3.24	8.88		8.88	22.7		3.27
Dibenz[a,h]anthracene	PAH	7.41		3.30	3.41	U	3.41	0.94	J	3.24	1.01	J	1.01	0.817	J	3.27
Fluoranthene	PAH	99.6		3.30	3.41	U	3.41	3.24	U	3.24	30.0		30.0	68.9		3.27
Fluorene	PAH	3.08	J	3.30	3.41	U	3.41	3.24	U	3.24	3.21	U	3.21	0.948	J	3.27
Indeno(1,2,3-cd)pyrene	PAH	79.7		3.30	3.41	U	3.41	8.26		3.24	1.46	J	1.46	4.87		3.27
Naphthalene	PAH	3.30	U	3.30	3.41	U	3.41	3.24	U	3.24	3.21	U	3.21	3.27	UJ	3.27
Phenanthrene	PAH	60.8		3.30	3.68		3.41	5.12		3.24	4.57		4.57	8.01		3.27
Pyrene	PAH	63.4		3.30	2.91	J	3.41	5.90		3.24	14.8		14.8	26.9		3.27
1,1,1-Trichloroethane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,1,2,2-Tetrachloroethane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,1,2-Trichloroethane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,1-Dichloroethane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,1-Dichloroethene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,2-Dichloroethane	VOA	5.94	U	5.94	5.61	U	5.61	5.63	U	5.63	6.50	U	6.50	5.37	U	5.37
1,2-Dichloroethene(Total)	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
1,2-Dichloropropane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
2-Butanone	VOA	11.9	U	11.9	11.2	U	11.2	11.3	U	11.3	13.0	U	13.0	10.7	U	10.7
2-Hexanone	VOA	11.9	U	11.9	11.2	U	11.2	11.3	U	11.3	13.0	U	13.0	10.7	U	10.7
4-Methyl-2-Pentanone	VOA	11.9	U	11.9	11.2	U	11.2	11.3	U	11.3	13.0	U	13.0	10.7	U	10.7
Acetone	VOA	11.9	U	11.9	11.2	U	11.2	11.3	U	11.3	13.0	U	13.0	10.7	U	10.7
Benzene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Bromodichloromethane	VOA	5.94	U	5.94	5.61	U	5.61	5.63	U	5.63	6.50	U	6.50	5.37	U	5.37
Bromoform	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Bromomethane	VOA	9.90	U	9.90	9.36	U	9.36	9.39	U	9.39	10.8	U	10.8	8.96	U	8.96
Carbon disulfide	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Carbon tetrachloride	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Chlorobenzene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Chloroethane	VOA	9.90	U	9.90	9.36	U	9.36	9.39	U	9.39	10.8	U	10.8	8.96	U	8.96
Chloroform	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Chloromethane	VOA	9.90	U	9.90	9.36	U	9.36	9.39	U	9.39	10.8	U	10.8	8.96	U	8.96
cis-1,2-Dichloroethylene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
cis-1,3-Dichloropropene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Dibromochloromethane	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Ethylbenzene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Methylenechloride	VOA	5.94	U	5.94	5.61	U	5.61	7.24	B	5.63	8.21	B	6.50	10	U	5.37
Styrene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Tetrachloroethene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Toluene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
trans-1,2-Dichloroethylene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
trans-1,3-Dichloropropene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Trichloroethene	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48
Vinyl chloride	VOA	9.90	U	9.90	9.36	U	9.36	9.39	U	9.39	10.8	U	10.8	8.96	U	8.96
Xylenes (total)	VOA	4.95	U	4.95	4.68	U	4.68	4.69	U	4.69	5.41	U	5.41	4.48	U	4.48

Attachment	1	Sheet No.	10 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1B8Y5, OB-2			J1B8Y6, OB-3			J1B8Y7, OB-4			J1B900, Trip blank		
		9/8/10			9/8/10			9/8/10			9/8/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.31	U	3.31	0.988	J	3.34	3.34	UJ	3.34			
Acenaphthylene	PAH	4.65		3.31	3.34	U	3.34	3.34	U	3.34			
Anthracene	PAH	0.827	J	3.31	3.34	U	3.34	3.34	U	3.34			
Benzo(a)anthracene	PAH	14.9		3.31	8.05		3.34	26.1		3.34			
Benzo(a)pyrene	PAH	19.4		3.31	26.6		3.34	63.8		3.34			
Benzo(b)fluoranthene	PAH	61.7		3.31	31.9		3.34	79.1		3.34			
Benzo(ghi)perylene	PAH	42.2		3.31	39.6		3.34	94.3		3.34			
Benzo(k)fluoranthene	PAH	19.6		3.31	15.7		3.34	39.9		3.34			
Chrysene	PAH	20.8		3.31	10.5		3.34	40.2		3.34			
Dibenz[a,h]anthracene	PAH	3.43		3.31	3.03	J	3.34	7.94		3.34			
Fluoranthene	PAH	71.9		3.31	34.1		3.34	61.5		3.34			
Fluorene	PAH	1.94	J	3.31	3.34	U	3.34	3.34	U	3.34			
Indeno(1,2,3-cd)pyrene	PAH	27.2		3.31	32.6		3.34	70.1		3.34			
Naphthalene	PAH	3.31	U	3.31	3.34	UJ	3.34	3.34	UJ	3.34			
Phenanthrene	PAH	8.67		3.31	4.82		3.34	8.96		3.34			
Pyrene	PAH	39.7		3.31	23.1		3.34	45.2		3.34			
1,1,1-Trichloroethane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,1,2,2-Tetrachloroethane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,1,2-Trichloroethane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,1-Dichloroethane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,1-Dichloroethene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,2-Dichloroethane	VOA	5.97	U	5.97	6.31	U	6.31	5.5	U	5.5	5.56	U	5.56
1,2-Dichloroethene(Total)	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
1,2-Dichloropropane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
2-Butanone	VOA	11.9	U	11.9	12.6	U	12.6	11.0	U	11.0	11.1	U	11.1
2-Hexanone	VOA	11.9	U	11.9	12.6	U	12.6	11.0	U	11.0	11.1	U	11.1
4-Methyl-2-Pentanone	VOA	11.9	U	11.9	12.6	U	12.6	11.0	U	11.0	11.1	U	11.1
Acetone	VOA	11.9	U	11.9	12.6	U	12.6	8.33	J	11.0	24.3		11.1
Benzene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Bromodichloromethane	VOA	5.97	U	5.97	6.31	U	6.31	5.50	U	5.50	5.56	U	5.56
Bromoform	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Bromomethane	VOA	9.95	U	9.95	10.5	U	10.5	9.16	U	9.16	9.26	U	9.26
Carbon disulfide	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Carbon tetrachloride	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Chlorobenzene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Chloroethane	VOA	9.95	U	9.95	10.5	U	10.5	9.16	U	9.16	9.26	U	9.26
Chloroform	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Chloromethane	VOA	9.95	U	9.95	10.5	U	10.5	9.16	U	9.16	9.26	U	9.26
cis-1,2-Dichloroethylene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
cis-1,3-Dichloropropene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Dibromochloromethane	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Ethylbenzene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Methylenechloride	VOA	8.49	B	5.97	10	U	6.31	10	U	5.50	10	U	5.56
Styrene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Tetrachloroethene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Toluene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
trans-1,2-Dichloroethylene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
trans-1,3-Dichloropropene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Trichloroethene	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63
Vinyl chloride	VOA	9.95	U	9.95	10.5	U	10.5	9.16	U	9.16	9.26	U	9.26
Xylenes (total)	VOA	4.98	U	4.98	5.26	U	5.26	4.58	U	4.58	4.63	U	4.63

Attachment	1	Sheet No.	11 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

Sample Location	HEIS Number	Sample Date	Acetone			Methylene chloride			Acenaphthene			Acenaphthylene			Anthracene			Benzo(a)anthracene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EX-5	J1B8W7	9/8/10	13.1	U	13.1	5.76	BJ	6.55	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
Duplicate of J1B8W7	J1B8Y2	9/8/10	11.9	U	11.9	8.79	B	5.93	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40
EX-1	J1B8W6	9/8/10	10.8	U	10.8	4.36	BJ	5.39	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-2	J1B8X0	9/8/10	9.86	U	9.86	4.44	BJ	4.93	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35
EX-3	J1B8W8	9/8/10	8.49	BJ	9.62	4.71	BJ	4.81	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-4	J1B8W9	9/8/10	11.3	BJ	12.8	6.83	B	6.41	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-6	J1B8X1	9/8/10	11.9	U	11.9	5.97	U	5.97	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-7	J1B8X2	9/8/10	10.6	U	10.6	5.31	U	5.31	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17
EX-8	J1B8X3	9/8/10	12.2	U	12.2	6.12	U	6.12	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
EX-9	J1B8X4	9/8/10	12.2	U	12.2	6.11	U	6.11	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-10	J1B8X5	9/8/10	12.4	U	12.4	6.20	U	6.20	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-11	J1B8X6	9/8/10	11.3	U	11.3	5.65	U	5.65	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27
EX-12	J1B8X7	9/8/10	11.8	U	11.8	5.88	U	5.88	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23
SPA-1	J1B8X8	9/8/10	12.6	U	12.6	6.31	U	6.31	1.62	J	3.14	3.14	U	3.14	3.14	U	3.14	1.46	J	3.14
Duplicate of J1B8X8	J1B8Y3	9/8/10	11.7	U	11.7	7.27	B	5.84	3.26	U	3.26	4.86		3.26	3.26	U	3.26	1.79	J	3.26
SPA-2	J1B8X9	9/8/10	11.9	U	11.9	5.94	U	5.94	57.6		3.30	31.4		3.30	3.30	U	3.30	29.5		3.30
SPA-3	J1B8Y0	9/8/10	11.2	U	11.2	5.61	U	5.61	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	1.04	J	3.41
SPA-4	J1B8Y1	9/8/10	11.3	U	11.3	7.24	B	5.63	3.24	U	3.24	3.24	U	3.24	3.24	U	3.24	3.52		3.24
OB-1	J1B8Y4	9/8/10	13.0	U	13.0	8.21	B	6.50	3.21	U	3.21	3.21	U	3.21	3.21	U	3.21	5.79		3.21
Duplicate of J1B8Y4	J1B8Y8	9/8/10	10.7	U	10.7	10	U	5.37	1.24	J	3.27	3.27	U	3.27	3.27	U	3.27	7.93		3.27
OB-2	J1B8Y5	9/8/10	11.9	U	11.9	8.49	B	5.97	3.31	U	3.31	4.65		3.31	0.827	J	3.31	14.9		3.31
OB-3	J1B8Y6	9/8/10	12.6	U	12.6	10	U	6.31	0.988	J	3.34	3.34	U	3.34	3.34	U	3.34	8.05		3.34
OB-4	J1B8Y7	9/8/10	8.33	J	11.0	10	U	5.50	3.3	UJ	3.34	3.34	U	3.34	3.34	U	3.34	26.1		3.34
Trip blank	J1B900	9/8/10	24.3		11.1	10	U	5.56												

Attachment	1	Sheet No.	12 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

Sample Location	HEIS Number	Sample Date	Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Dibenz[a,h]anthracene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EX-5	J1B8W7	9/8/10	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
Duplicate of J1B8W7	J1B8Y2	9/8/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40
EX-1	J1B8W6	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-2	J1B8X0	9/8/10	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35
EX-3	J1B8W8	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-4	J1B8W9	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-6	J1B8X1	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-7	J1B8X2	9/8/10	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17
EX-8	J1B8X3	9/8/10	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
EX-9	J1B8X4	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-10	J1B8X5	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-11	J1B8X6	9/8/10	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27
EX-12	J1B8X7	9/8/10	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23	3.09	J	3.23	3.23	U	3.23
SPA-1	J1B8X8	9/8/10	2.18	J	3.14	3.11	J	3.14	3.63		3.14	1.27	J	3.14	3.14	U	3.14	3.14	U	3.14
Duplicate of J1B8X8	J1B8Y3	9/8/10	3.36		3.26	4.78		3.26	5.30		3.26	2.04	J	3.26	2.28	J	3.26	3.26	U	3.26
SPA-2	J1B8X9	9/8/10	55.3		3.30	99.2		3.30	103		3.30	44.2		3.30	42.4		3.30	7.41		3.30
SPA-3	J1B8Y0	9/8/10	3.19	J	3.41	4.29		3.41	4.60		3.41	1.93	J	3.41	3.41	U	3.41	3.41	U	3.41
SPA-4	J1B8Y1	9/8/10	12.0		3.24	12.9		3.24	13.5		3.24	6.17		3.24	4.49		3.24	0.94	J	3.24
OB-1	J1B8Y4	9/8/10	6.75		3.21	17.8		3.21	10.0		3.21	7.86		3.21	8.88		3.21	1.01	J	3.21
Duplicate of J1B8Y4	J1B8Y8	9/8/10	5.21		3.27	24.8		3.27	8.94		3.27	8.52		3.27	22.7		3.27	0.817	J	3.27
OB-2	J1B8Y5	9/8/10	19.4		3.31	61.7		3.31	42.2		3.31	19.6		3.31	20.8		3.31	3.43		3.31
OB-3	J1B8Y6	9/8/10	26.6		3.34	31.9		3.34	39.6		3.34	15.7		3.34	10.5		3.34	3.03	J	3.34
OB-4	J1B8Y7	9/8/10	63.8		3.34	79.1		3.34	94.3		3.34	39.9		3.34	40.2		3.34	7.94		3.34
Trip blank	J1B900	9/8/10																		

Attachment	1	Sheet No.	13 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

Attachment 1. 600-188 Waste Site Verification Sample Results (Organics).

Sample Location	HEIS Number	Sample Date	Fluoranthene			Fluorene			Indeno(1,2,3-cd) pyrene			Phenanthrene			Pyrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EX-5	J1B8W7	9/8/10	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
Duplicate of J1B8W7	J1B8Y2	9/8/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	0.901	J	3.40	3.40	U	3.40
EX-1	J1B8W6	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-2	J1B8X0	9/8/10	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35	3.35	U	3.35
EX-3	J1B8W8	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-4	J1B8W9	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-6	J1B8X1	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-7	J1B8X2	9/8/10	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17	3.17	U	3.17
EX-8	J1B8X3	9/8/10	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31	3.31	U	3.31
EX-9	J1B8X4	9/8/10	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36	3.36	U	3.36
EX-10	J1B8X5	9/8/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29
EX-11	J1B8X6	9/8/10	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27	3.27	U	3.27
EX-12	J1B8X7	9/8/10	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23	3.23	U	3.23
SPA-1	J1B8X8	9/8/10	3.14	U	3.14	3.14	U	3.14	3.14	U	3.14	3.76		3.14	1.63	J	3.14
Duplicate of J1B8X8	J1B8Y3	9/8/10	3.26	U	3.26	0.962	J	3.26	2.63	J	3.26	4.68		3.26	3.33		3.26
SPA-2	J1B8X9	9/8/10	99.6		3.30	3.08	J	3.30	79.7		3.30	60.8		3.30	63.4		3.30
SPA-3	J1B8Y0	9/8/10	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.68		3.41	2.91	J	3.41
SPA-4	J1B8Y1	9/8/10	3.24	U	3.24	3.24	U	3.24	8.26		3.24	5.12		3.24	5.90		3.24
OB-1	J1B8Y4	9/8/10	30.0		3.21	3.21	U	3.21	1.46	J	3.21	4.57		3.21	14.8		3.21
Duplicate of J1B8Y4	J1B8Y8	9/8/10	68.9		3.27	0.948	J	3.27	4.87		3.27	8.01		3.27	26.9		3.27
OB-2	J1B8Y5	9/8/10	71.9		3.31	1.94	J	3.31	27.2		3.31	8.67		3.31	39.7		3.31
OB-3	J1B8Y6	9/8/10	34.1		3.34	3.34	U	3.34	32.6		3.34	4.82		3.34	23.1		3.34
OB-4	J1B8Y7	9/8/10	61.5		3.34	3.34	U	3.34	70.1		3.34	8.96		3.34	45.2		3.34
Trip blank	J1B900	9/8/10															

Attachment	1	Sheet No.	14 of 14
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0600X-CA-V0098	Rev. No.	0

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 (WHC 2010b). This DQA was performed in accordance with site specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009).

A review of the sample design (WCH 2010b), the field logbook (WCH 2010a), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design. To ensure quality data, the SAP data assurance requirements and the data validation procedure for chemical analysis (BHI 2000) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., 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 sample data collected at the 600-188 waste site were provided by the laboratories in two sample delivery groups (SDGs): SDG K2351 and SDG K2347. SDG K2351 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed 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.

SDG K2351

This SDG comprises three verification soil samples (J1B8Y6 through J1B8Y8) from the 600-188 overburden. These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, polycyclic aromatic hydrocarbons (PAH), volatile organic compounds (VOC), and total petroleum hydrocarbons (TPH). In addition, one equipment blank (J1B8Y9) was collected and analyzed for ICP metals and mercury, and one trip blank (J1B900) was collected and analyzed for VOC. SDG K2351 was submitted for third-party validation. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2351 were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), and laboratory control sample (LCS) analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the VOC analysis, the detected methylene chloride results are of similar magnitude as the method blank results, and may be considered estimated due to method blank contamination. All detected methylene chloride sample results were raised to the required quantitation limit (RQL),

qualified as undetected estimates, and flagged "U" by third-party validation. The data are usable for decision-making purposes.

In the PAH analysis, the MS/MSD relative percent differences (RPDs) for naphthalene (44%) and acenaphthene (41%), are above the quality control (QC) limit of 30%. The results for these PAHs were considered estimated and flagged "J" by third-party validation. Estimated data are acceptable for decision-making purposes.

In the ICP metals analysis, the calcium result for sample J1B8Y9 (the equipment blank) is of similar magnitude as the method blank result, and may be considered estimated due to method blank contamination. The sample J1B8Y9 calcium result was qualified as an undetected estimate, and flagged "UJ" by third-party validation. The data is usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for five analytes (aluminum, iron, manganese, antimony, and silicon). For most of these 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 analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony did not have mismatched spike and native concentrations in the original MS. The original MS recovery for antimony was 38%. All antimony data for SDG K2351 were considered estimated and flagged "J" by third-party validation due to the MS recoveries outside the QC limits. Estimated data are usable for decision-making purposes.

SDG K2347

This SDG comprises 13 verification soil samples (J1B8W6 through J1B8W9, J1B8X0 through J1B8X7, J1B8Y2) from the 600-188 excavation, five verification samples (J1B8X8 through J1B8X9, J1B8Y0 through J1B8Y1, J1B8Y3) from the 600-188 staging pile area, and two verification samples (J1B8Y4 through J1B8Y5) from the 600-188 overburden. This SDG includes two field duplicate pairs (J1B8W7/J1B8Y2 and J1B8X8/J1B8Y3). These samples were analyzed for ICP metals, mercury, PAH, VOC, and TPH. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2347 may be considered estimated due to lack of an MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

In the VOC analysis, the detected methylene chloride results are of similar magnitude as the method blank results, and may be considered estimated due to method blank contamination. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for four analytes (aluminum, iron, antimony, and silicon). For aluminum, iron, and silicon 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 analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony did not

have mismatched spike and native concentrations in the original MS. The original MS recovery for antimony was 55%. All antimony data for SDG K2347 may be considered estimated. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

RPD evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratory. Any deficiencies in those calculations are reported by SDG in the previous sections.

Field quality assurance/quality control (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbook (WCH 2010a), 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	J1B8W7	J1B8Y2
Staging Area	J1B8X8	J1B8Y3
Overburden	J1B8Y4	J1B8Y8

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 (COPC). RPDs 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. RPDs of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The RPD calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

The RPDs calculated for barium (41.8%) and manganese (37.3%) in the excavation field duplicate sample (J1B8Y2) and the RPD calculated for silicon (46.2%) in the overburden field duplicate sample (J1B8Y8) are above the acceptance criteria (30%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. The flouranthene and TPH-motor oil data for the overburden duplicate sample required this check. These results are attributed to heterogeneities in the sample matrix from which the samples were collected. 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 600-188 waste site verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 600-188 waste site 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 Environmental Restoration (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System (HEIS) 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.

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

WCH, 2010a, *IU-2/6 Remaining Sites Sampling and Field Activities*, Logbook EL-1643-02 pp. 70-72, Washington Closure Hanford, Richland, Washington.

WCH, 2010b, *Work Instruction for Verification Sampling of the 600-188, White Bluffs Waste Disposal Trench 2,* Work Instruction No. 0600X-WI-G0050, Rev. 0, Washington Closure Hanford, Richland, Washington.