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

11-AMRC-0082

FEB 16 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 600-124, WHITE BLUFFS BURN SITE AND PAINT DISPOSAL AREA, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2010-094 and supporting documentation for the "600-124, White Bluffs Burn Site and Paint Disposal Area," 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
M. L. Proctor, WCH

Date Submitted: 12/06/2010 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-IU-2 Waste Site Code: 600-124 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2010-094

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 600-124, White Bluffs Burn Site and Paint Disposal Area waste site was a 40- by 25-m (130- by 80-ft) area that contained surface debris and wooden boards. Burned wood, roofing materials, glass, nails, metallic debris, transite, tar, and paint cans were visible on the ground surface and were thought to be associated with a warehouse and storage area. There is no other known process history associated with the site. The 600-124 waste site is located on the west side of Route 2 North, along the railroad tracks, approximately 640 m (2,100 ft) southeast of the intersection of Route 2 North and Federal Avenue. The 600-124 waste site is identified as a remaining site for remediation 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).

Remedial action at the 600-124 waste site was performed in January 2010. The remediation resulted in approximately 1 m (3 ft) of material scraped from the surface and placed in a staging pile area located just south of the excavation 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 600-124 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 600-124 waste site is protective of groundwater and the Columbia River. 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 600-124, White Bluffs Burn Site and Paint Disposal Area* (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)	Signature	1/21/10 Date
N/A Ecology Project Manager (printed)	Signature	Date
C. Guzzetti EPA Project Manager (printed)	Signature	1/27/11 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-124, WHITE BLUFFS BURN SITE AND PAINT DISPOSAL AREA

Attachment to Waste Site Reclassification Form 2010-094

December 2010

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-124, WHITE BLUFFS BURN SITE AND PAINT DISPOSAL AREA

EXECUTIVE SUMMARY

The 600-124 White Bluffs Burn Site and Paint Disposal Area waste site, located just to the west of the railroad tracks along Route 2 North, approximately 640 m (2,100 ft) southeast of the intersection of Route 2 North and Federal Avenue in the 100-IU-2 Operable Unit, was a 40- by 25-m (130- by 80-ft) area that contained surface debris and wooden boards. Most of the debris was concentrated in a pile near the northwest corner of the waste site. Burned wood, roofing materials, glass, nails, metallic debris, transite, tar, and paint cans were visible on the ground surface. A section of timber boards was found that appeared to be the remnants of a wooden floor.

The 600-124 waste site is thought to be related to the warehouse and storage area of the White Bluffs townsite. The White Bluffs area was selected as the location for the central shops to support the Manhattan Project. Modifications of existing facilities and construction of new support buildings began in 1943. The 600-124 waste site is located in an area indicated as a warehouse and storage area on Hanford drawing H-11-3709 (GE 1948). A note on the drawing indicates that storage platforms made with 5-cm (2-in.) thick by 30-cm (12-in.)-wide planks were present. A second Hanford drawing, C-3316 (HEW 1944) identifies the location having platforms and temporary buildings for pipe storage. There is no other known process history associated with the site.

Remedial action at the 600-124 waste site was performed in January 2010. The remediation resulted in approximately 1 m (3 ft) of material being scraped from the surface and placed in a staging pile area located just south of the excavation for later disposal at the Environmental Restoration Disposal Facility. Waste material that was encountered during remediation included paint cans, various colors of paint, tar roofing material, and pieces of wood and vitrified clay pipe.

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 600-124 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 600-124 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 600-124 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Radionuclides were not COPCs for the 600-124 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (2.3×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Excess cancer risk values for individual nonradionuclide 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 (1.8×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 600-124 waste site.	NA
	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].		

Table ES-1. Summary of Remedial Action Goals for the 600-124 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Benzo(a)pyrene and benzo(b)fluoranthene are present at concentrations slightly above soil RAGs for groundwater and/or Columbia River protection. However, an evaluation based upon the RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), residual concentrations of these constituents are not predicted to migrate vertically within 1,000 years based on the soil-partitioning coefficient (K_d) of 803 mL/g for benzo(b)fluoranthene (the contaminant with the lower K_d value). Therefore, residual concentrations of benzo(a)pyrene and benzo(b)fluoranthene 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).

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
K_d = distribution coefficient
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*

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. The 600-124 waste site does not extend into the deep zone. 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 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. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of antimony, manganese, vanadium, and zinc were all below Hanford Site background values, 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 at this time; 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 600-124, WHITE BLUFFS BURN SITE AND PAINT DISPOSAL AREA

STATEMENT OF PROTECTIVENESS

The 600-124, White Bluffs Burn Site and Paint Disposal Area 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. This site does not extend into the deep zone. 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 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. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of antimony, manganese, vanadium, and zinc were all below Hanford Site background values, 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 at this time; 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.

GENERAL SITE INFORMATION AND BACKGROUND

The 600-124, White Bluffs Burn Site and Paint Disposal Area waste site, located in the 100-IU-2 Operable Unit, was a 40- by 25-m (130- by 80-ft) area that contained surface debris and wood boards. Most of the debris was concentrated in a pile near the northwest corner of the waste site. Burned wood, roofing materials, glass, nails, metallic debris, transite, tar, and paint cans were visible on the ground surface. A section of timber boards was found that appeared to be the remnants of a wood floor.

The 600-124 waste site is located on the west side of Route 2 North, approximately 640 m (2,100 ft) southeast of the intersection of Route 2 North and Federal Avenue. The site is just to the west of the railroad tracks along Route 2 North (Figure 1). The waste site is thought to be related to the White Bluffs townsite. The White Bluffs area was selected as the location for the central shops to support the Manhattan Project. Modifications of existing facilities and construction of new support buildings began in 1943. The 600-124 waste site is located in an area indicated as a warehouse and storage area on Hanford drawing H-11-3709 (GE 1948). A note on the drawing indicates that storage platforms made with 2 by 12 planks were present. A second Hanford drawing, C-3316 (HEW 1944) identifies the location having platforms and temporary buildings for pipe storage. There is no other known process history associated with the site.

Geophysical Survey

A geophysical survey was performed on the 600-124 waste site in 2004 (BHI 2004b). This survey indicated that a variety of mixed debris was scattered across much of the site, with most of it concentrated around a 1 to 1.5-m (3 to 4.9-ft)-high mound indicated to contain charcoal. The geophysical data indicated that most of the debris/material was on or very near the surface and not very concentrated. There were no noted geophysical anomalies associated with the mound; however, there were observed to be more scattered conductivity and magnetic anomalies in and around the mound than were observed in the surrounding terrain (BHI 2004b). No high concentrations of metallic debris were detected. Figure 2 shows the geophysical interpretation map overlaying a map of the surface features in the area.

Site Walkdown

Based on an initial site walkdown on February 5, 2004, confirmatory sampling was determined to be unnecessary, and the waste site was sent immediately to remove, treat, and dispose (RTD) (BHI 2004a).

A second site walkdown was completed on January 9, 2010, immediately prior to remediation. The purpose of the walkdown was to evaluate the field conditions, possible sampling logistics (i.e., accessibility, potential contaminants, and collection methods), and to locate and evaluate debris and anomalies that may require further evaluation or removal in order to reclassify the site as clean. Photographs of the waste site collected during this walkdown are provided in Appendix A.

REMEDIAL ACTION SUMMARY

Remediation occurred from January 11 to 18, 2010. The remediation resulted in approximately 1 m (3 ft) of material being scraped from the surface and placed in a staging pile area located just south of the excavation for later disposal at the Environmental Restoration Disposal Facility (ERDF). Several paint cans containing various colors of paint were encountered during remedial activities. Tar roofing material and pieces of vitrified clay pipe were among the other items sent to the ERDF with the paint cans and other material scraped from the surface of the site.

Figure 1. The 600-124 Waste Site Location Map.

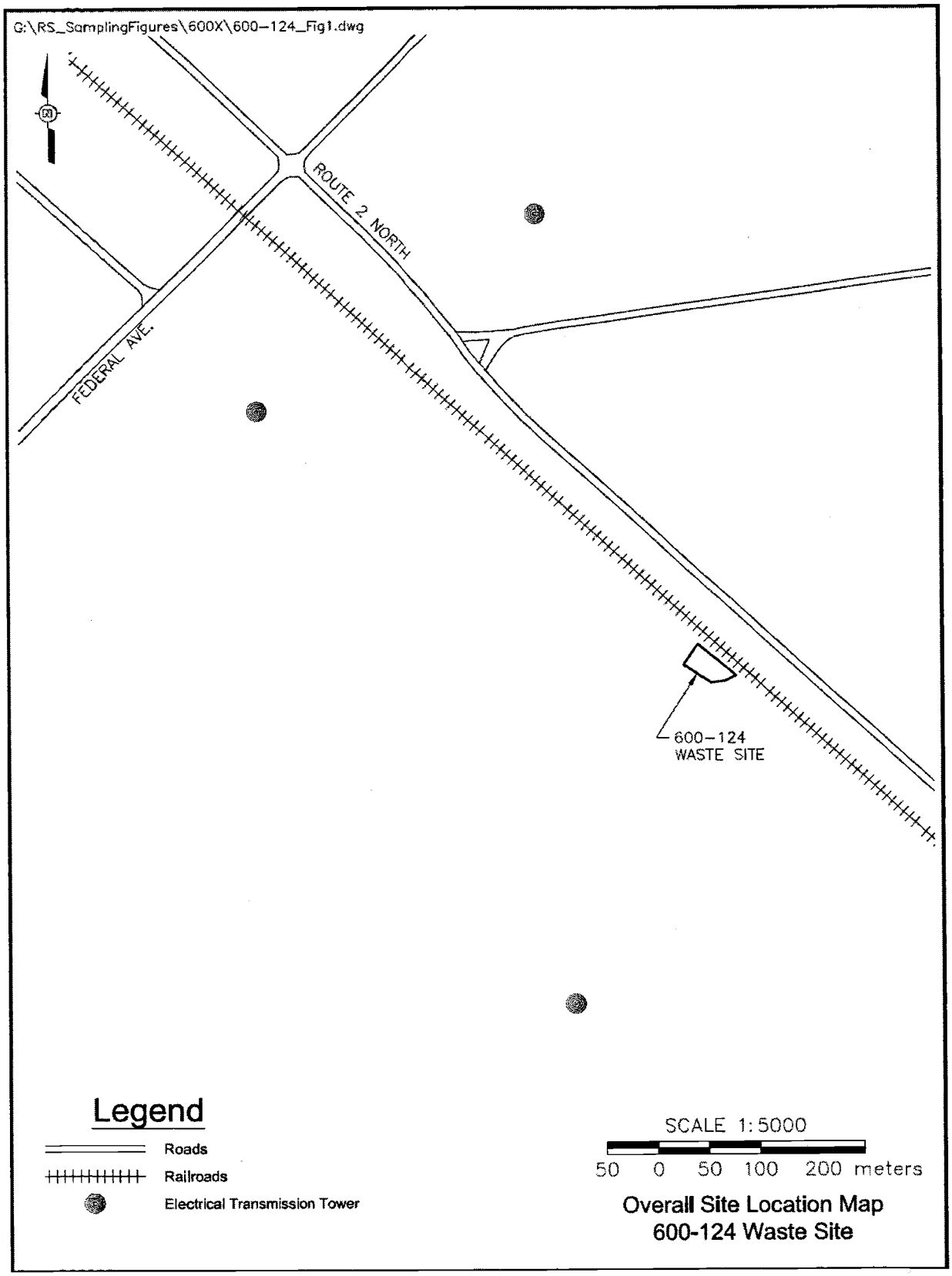
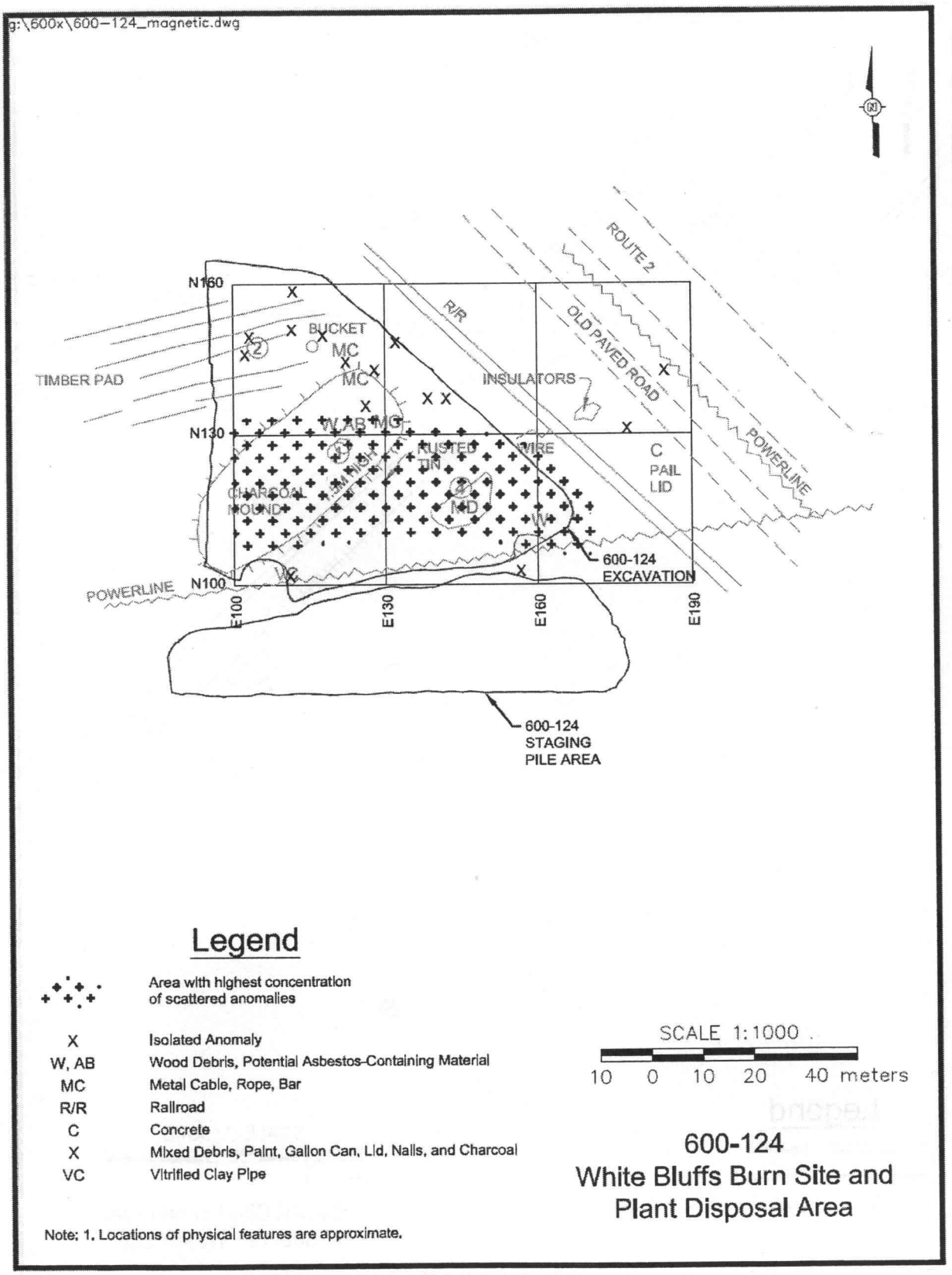


Figure 2. The 600-124 Waste Site Geophysical Interpretation Map.



VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 600-124 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 provided in Appendix B indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) for the 600-124 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 600-124, White Bluffs Burn Site and Paint Disposal Area* (WCH 2010b).

Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 600-124 waste site were preliminarily identified in the RDR/RAWP as polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), asbestos, barium, cadmium, chromium (total), hexavalent chromium, mercury, lead, selenium, silver, and sulfate. Field observations and the results of waste characterization and in-process samples were used to refine the list of COPCs (Appendix C).

Arsenic, cadmium, chromium, copper, lead, selenium, zinc, and PCBs associated with paint disposal were detected in the waste characterization samples. Polycyclic aromatic hydrocarbons (PAH) and TPH were detected in the in-process soil samples and were therefore included as COPCs. Pesticides and PCBs were also detected in waste characterization samples, but were collocated with the lead in paint samples and were not detected during in-process sampling; therefore, pesticides and PCBs were eliminated as COPCs.

Several SVOCs were detected during waste characterization sampling; however, the analytical results were estimated below the practical quantitation limit and SVOCs were not detected during in-process sampling; therefore, they were eliminated as COPCs. Because friable asbestos was not observed during remediation, it was eliminated as a COPC. Hexavalent chromium was not detected during waste characterization or in-process sampling, and was not included as a COPC. Sulfate was also identified in the RDR/RAWP as a COPC, but was not detected above cleanup criteria in the in-process samples and was eliminated as a COPC. Barium, mercury, selenium, and silver were not detected above cleanup criteria in any of the samples and were therefore eliminated as COPCs. Volatile organic compounds were not detected in waste characterization samples and were also eliminated as COPCs.

Although not considered COPCs, analyses for the constituents of the expanded inductively coupled plasma (ICP) metals list was performed to include antimony, barium, beryllium, boron, cobalt, manganese, molybdenum, nickel, selenium, silver, and vanadium.

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

Table 1. 600-124 Laboratory Analytical Methods.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Arsenic, cadmium, total chromium, copper, lead, selenium, zinc
PAH – EPA Method 8310	PAH
TPH – NWTPH–Dx	TPH

[a] Analyses were 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.

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

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 600-124 waste site. A statistical sampling design was used to collect soil samples from the excavation and staging pile area, at the coordinates provided in Table 2. Figure 3 shows the waste site footprint and the sampling locations.

Table 2. 600-124 Verification Sampling Summary Table. (2 Pages)

Sample Location	HEIS Number	Washington State Plane Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
EX-1	J1B8R1	147521.3	578494.8	ICP metals [a], PAH, TPH
EX-2	J1B8R2	147533.6	578507.1	
EX-3	J1B8R3	147513.5	578465.8	
EX-4	J1B8R4	147525.8	578478.1	
EX-5	J1B8R5	147538.0	578490.4	
EX-6	J1B8R6	147518.0	578449.1	
EX-7	J1B8R7	147530.3	578461.3	
EX-8	J1B8R8	147542.5	578473.6	
EX-9	J1B8R9	147554.8	578485.9	
EX-10	J1B8T0	147547.0	578456.9	
EX-11	J1B8T1	147559.3	578469.1	
EX-12	J1B8T2	147563.8	578452.4	
Duplicate of EX-1	J1B8T3	147521.3	578494.8	
SPA-1	J1B9T4	147488.7	578508.8	
SPA-2	J1B8T5	147492.1	578521.0	
SPA-3	J1B8T6	147490.7	578475.2	
SPA-4	J1B8T7	147494.2	578487.4	
SPA-5	J1B8T8	147497.6	578499.7	

Table 2. 600-124 Verification Sampling Summary Table. (2 Pages)

Sample Location	HEIS Number	Washington State Plane Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
SPA-6	J1B8T9	147501.0	578511.9	ICP metals [a], PAH, TPH
SPA-7	J1B8V0	147492.8	578441.6	
SPA-8	J1B8V1	147496.2	578453.9	
SPA-9	J1B8V2	147499.6	578466.1	
SPA-10	J1B8V3	147503.0	578478.4	
SPA-11	J1B8V4	147506.5	578490.6	
SPA-12	J1B8V5	147509.9	578502.8	
Duplicate of SPA-1	J1B8V6	147488.7	578508.8	
Equipment blank	J1B8V7	NA	NA	ICP metals [a]

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

EX = excavation
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
SPA = staging pile area
TPH = total petroleum hydrocarbons

The excavation extended to a depth of approximately 1 m (3 ft) bgs, and the vadose zone beneath the excavation is approximately 8.3 m (27.2 ft) thick. Twenty-four statistical verification soil samples were collected on a grid that included the excavated area 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 and staging pile area decision units 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 area, the maximum detected value was used for comparison to remedial action goals (RAGs). 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 for COPCs to the RAGs for the excavation and staging pile area are presented in Tables 3 and 4, 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.

Figure 3. 600-124 Verification Sample Locations.

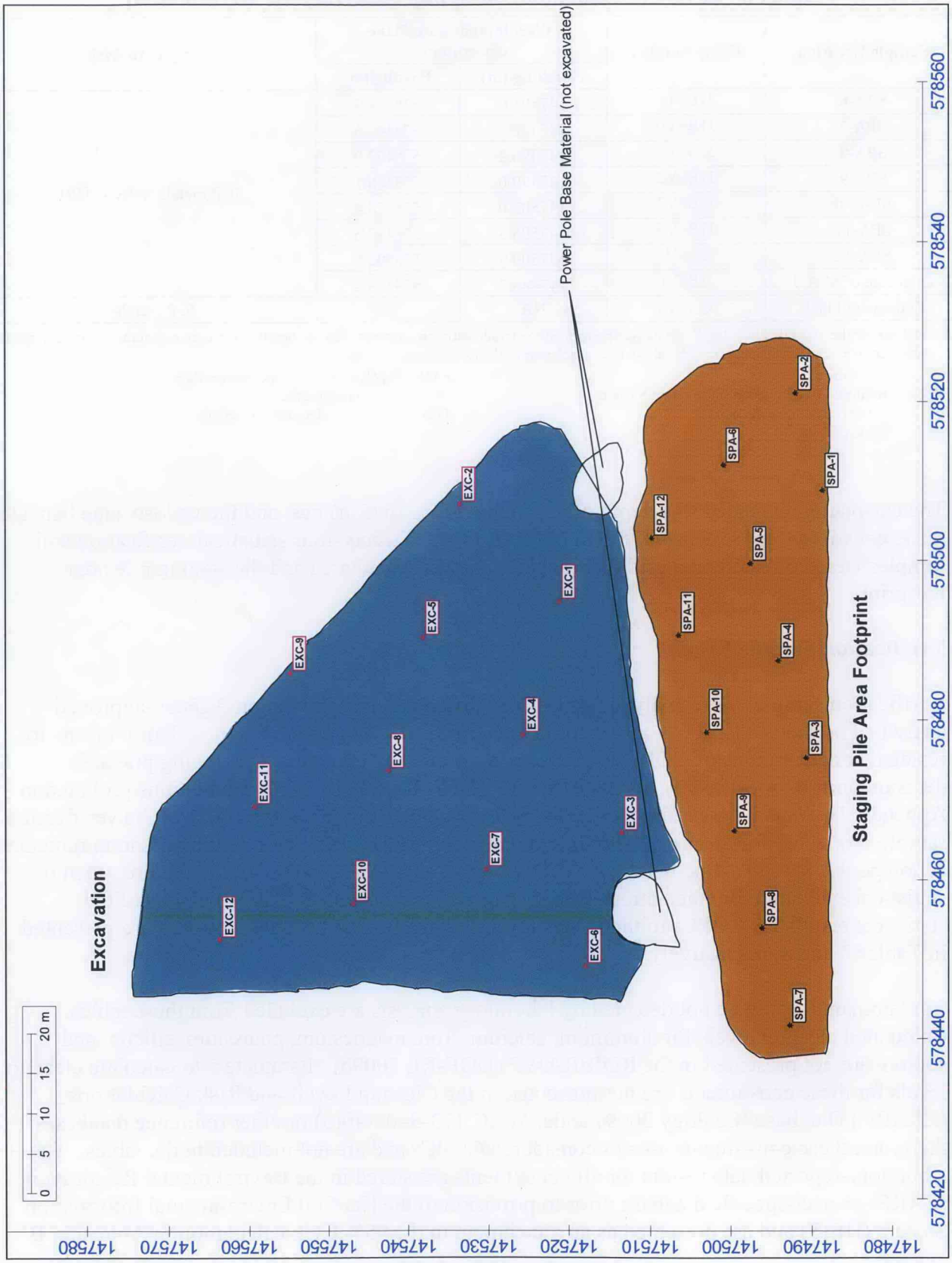


Table 3. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-124 Excavation Verification Sampling Data. (2 Pages)

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		
Arsenic	2.11 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	67.9 (<BG)	5,600	200	400	No	--
Beryllium	0.256 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.25	7,200	320	-- [f]	No	--
Cadmium [g]	0.167 (<BG)	13.9 [e]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	6.69 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	12.2 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	3.67 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	322 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.456	400	8	-- [f]	No	--
Nickel	10.0 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	68.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	42.7 (<BG)	24,000	480	67.8 [c]	No	--
TPH – motor oil	4.22	200	200	200	No	--
Acenaphthene	0.192	4,800	96	129	No	--
Acenaphthylene	1.41	4,800	96	129	No	--
Benzo(a)anthracene	0.0114	1.37	0.015 [h]	0.015 [h]	No	--
Benzo(a)pyrene	0.0183	0.137	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(b)fluoranthene	0.0160	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(ghi)perylene [j]	0.0238	2,400	48	192	No	--
Benzo(k)fluoranthene	0.00731	1.37	0.015 [h]	0.015 [h]	No	--
Chrysene	0.0261	13.7	0.12	0.1 [h]	No	--
Dibenz(a,h)anthracene	0.00405	1.37	0.03	0.03	No	--
Fluoranthene	0.0761	3,200	64	18.0	No	--
Fluorene	0.0253	3,200	64	260	No	--
Naphthalene	0.113	1,600	16.0	988	No	--
Phenanthrene [j]	0.156	24,000	240	1,920	No	--

Table 3. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-124 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		
Pyrene	0.0419	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) unless otherwise noted.
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3] (Ecology 1996) (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m3 (*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] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)pyrene and benzo(b)fluoranthene are not expected to migrate vertically in 1,000 years (based on the distribution coefficient of benzo(b)fluoranthene of 803 mL/g). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.
[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: benzo(ghi)perylene, surrogate: pyrene; phenanthrene, surrogate: anthracene.

-- = not applicable; only applicable for direct exposure
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
RDL = required detection limit
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 4. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-124 Staging Pile Area 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	0.286 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.27 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	66.6 (<BG)	5,600	200	400	No	--
Beryllium	0.255 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	2.15	7,200	320	-- [f]	No	--
Cadmium [g]	0.168 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	11.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	6.54 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.9 (<BG)	2,960	59.2	22.0 [c]	Yes	Yes[h]
Lead	5.09 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	311 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.618	400	8	-- [f]	No	--
Nickel	11.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	66.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	47.1 (<BG)	24,000	480	67.8 [c]	No	--
TPH – motor oil	51.3	200	200	200	No	--
Acenaphthene	0.0013	4,800	96	129	No	--
Benzo(a)anthracene	0.00276	1.37	0.015 [i]	0.015 [i]	No	--
Benzo(a)pyrene	0.00300	0.137	0.015 [i]	0.015 [i]	No	--
Benzo(b)fluoranthene	0.00431	1.37	0.015 [i]	0.015 [i]	No	--
Benzo(ghi)perylene [j]	0.00386	2,400	48	192	No	--
Benzo(k)fluoranthene	0.00467	1.37	0.015 [i]	0.015 [i]	No	--
Chrysene	0.00271	13.7	0.12	0.1 [i]	No	--
Dibenz(a,h)anthracene	0.00198	1.37	0.03 [i]	0.03 [i]	No	--
Fluoranthene	0.00692	3,200	64	18.0	No	--
Fluorene	0.00333	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.0205	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [j]	0.00298	24,000	240	1,920	No	--

Table 4. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-124 Staging Pile Area 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		
Pyrene	0.00627	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) unless otherwise noted.
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3] (Ecology 1996) (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m3 (*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] Copper results exceed the groundwater and river protection RAGs for greater than 10% of the statistical results; however, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of copper are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the distribution coefficient of copper of 22 mL/g). Therefore, residual concentrations of copper are predicted to be protective of groundwater and the Columbia River.
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: benzo(ghi)perylene, surrogate: pyrene; phenanthrene, surrogate: anthracene.

-- = not applicable; only applicable for direct exposure
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 for the 100 Area*
RESRAD = RESidual RADioactivity
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

DATA EVALUATION

Nonradionuclides

Tables 3 and 4 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)pyrene and benzo(b)fluoranthene within the excavation were quantified at concentrations exceeding soil RAGs for protection of groundwater and/or river protection. Data were not collected on the vertical extent of these contaminants, but given the lowest soil-partitioning coefficient for these constituents (803 mL/g for benzo(b)fluoranthene), neither would be expected to migrate vertically in 1,000 years (DOE-RL 2009b). Therefore, residual

concentrations of benzo(a)pyrene and benzo(b)fluoranthene 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.

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 600-124 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, except for copper, benzo(a)pyrene, and benzo(b)fluoranthene in comparison against the soil RAGs for protection of groundwater and the Columbia River. However, as previously described, these constituents are not predicted to migrate more than 3 m (10 ft) vertically within 1,000 years. Residual concentrations are, therefore, protective of groundwater and the Columbia River.

Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 600-124 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 2.3×10^{-3}. All individual contaminant carcinogenic risk values were less than 1×10^{-6}, and the cumulative carcinogenic risk of 1.8×10^{-7} is less than the criteria of 1.0×10^{-5}. Based on the nonradionuclide groundwater and river protection RAGs shown in Tables 3 and 4, the residual concentrations of the nonradionuclide contaminants are protective of groundwater and the Columbia River.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2010b), the field logbook (WCH 2010a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 600-124 waste site 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 C. The detailed DQA is presented in Appendix D.

SUMMARY FOR INTERIM CLOSURE

The 600-124 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 achieve the remedial action goals and associated remedial action objectives for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 600-124 waste site to Interim Closed Out. The waste site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

REFERENCES

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APPENDIX A

PHOTOGRAPHS

Figure A-1. The 600-124 Waste Site Before Remediation (January 6, 2010).

Figure A-2. Blue Paint Chips at the 600-124 Waste Site (March 13, 2003).

Figure A-3. 600-124 Broken Shingles and Debris (February 9, 2004).

Figure A-4. 600-124 Possible Wood Floor (April 25, 2004).

Figure A-5. 600-124 Paint Chip Sampling (January 11, 2010).

Figure A-6. Vitrified Clay Pipe at the 600-124 Waste Site (February 18, 2010).

Figure A-7. 600-124 Waste Staging Pile (January 18, 2010).

Figure A-8. 600-124 Excavated Area (January 18, 2010).

APPENDIX B

RELATIVE PERCENT DIFFERENCE (RPD), DIRECT CONTACT HAZARD QUOTIENT, AND CARCINOGENIC RISK CALCULATIONS

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 100-IU-2

Discipline: Environmental *Calculation No: 0600X-CA-V0093

Subject: 600-124 Waste Site Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 18 Attm. 1 = 8 Total = 27	J. D. Skoglie	T. E. Queen	B. L. Vedder	D. F. Obenauer	11/18/10

SUMMARY OF REVISION

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

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie	**Date** 11/15/10	**Calc. No.** 0600X-CA-V0093	**Rev. No.** 0
Project 100-IU-2/6 Field Remediation	**Job No.** 14655	**Checked** T. E. Queen	**Date** 11/15/10
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 1 of 18

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 - Excavation
Sheet 7 to 9- Calculation Sheet Verification Data - Staging Pile Area
Sheet 10 to 16 - Ecology Software (MTCAStat) Results
Sheet 17 to 18 - Calculation Sheet Duplicate Analysis
Attachment 1 - 600-124, Verification Sampling Results (8 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, 2005a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2005b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 5, 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.
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8) Ecology, 1996, *Model Toxic Control Act Cleanup Levels and Risk Calculations (CLARC II),* Publication #94-145, Washington State Department of Ecology, Olympia, Washington.
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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 600-124 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 2005b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:

The 600-124 waste site consisted of 2 decision units for verification sampling: the excavation area and the staging pile area.

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.

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 2005b) 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 2005a) 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 J. D. Skoglie **Date** 11/17/10 **Calc. No.** 0600X-CA-V0093 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** T. E. Queen **Date** 11/17/10
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 3 of 18

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 and staging pile areas, 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	2.11	--	mg/kg
Barium	67.9	--	mg/kg
Beryllium	0.256	--	mg/kg
Boron	1.25	--	mg/kg
Cadmium	0.167	--	mg/kg
Chromium	10.5	--	mg/kg
Cobalt	6.69	--	mg/kg
Copper	12.2	--	mg/kg
Lead	3.67	--	mg/kg
Manganese	322	--	mg/kg
Molybdenum	0.456	--	mg/kg
Nickel	10.0	--	mg/kg
Vanadium	68.5	--	mg/kg
Zinc	42.7	--	mg/kg
Acenaphthene	--	0.192	mg/kg
TPH - motor oil	--	4.22	mg/kg
Acenaphthylene	--	1.41	mg/kg
Benzo(a)anthracene	--	0.0114	mg/kg
Benzo(a)pyrene	--	0.0183	mg/kg
Benzo(b)fluoranthene	--	0.0160	mg/kg
Benzo(ghi)perylene	--	0.0238	mg/kg
Benzo(k)fluoranthene	--	0.00731	mg/kg
Chrysene	--	0.0261	mg/kg
Dibenz(a,h)anthracene	--	0.00405	mg/kg
Fluoranthene	--	0.0761	mg/kg
Fluorene	--	0.0253	mg/kg
Naphthalene	--	0.113	mg/kg
Phenanthrene	--	0.156	mg/kg
Pyrene	--	0.0419	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 [a]

Analyte	95% UCL Result	Maximum Result	Units
Arsenic	2.27	--	mg/kg
Barium	66.6	--	mg/kg
Beryllium	0.255	--	mg/kg
Boron	2.15	--	mg/kg
Cadmium	0.168	--	mg/kg
Chromium	11.8	--	mg/kg
Cobalt	6.54	--	mg/kg
Copper	15.9	--	mg/kg
Lead	5.09	--	mg/kg
Manganese	311	--	mg/kg
Molybdenum	0.618	--	mg/kg
Nickel	11.2	--	mg/kg
Vanadium	66.6	--	mg/kg
Zinc	47.1	--	mg/kg
TPH - motor oil	51.3	--	mg/kg
Benzo(a)anthracene	0.00276	--	mg/kg
Benzo(a)pyrene	0.00300	--	mg/kg
Benzo(b)fluoranthene	0.00431	--	mg/kg
Benzo(ghi)perylene	0.00386	--	mg/kg
Chrysene	0.00271	--	mg/kg
Fluoranthene	0.00692	--	mg/kg
Phenanthrene	0.00298	--	mg/kg
Pyrene	0.00627	--	mg/kg
Antimony	--	0.286	mg/kg
Acenaphthene	--	0.0013	mg/kg
Benzo(k)fluoranthene	--	0.00467	mg/kg
Dibenz(a,h)anthracene	--	0.00198	mg/kg
Fluorene	--	0.00333	mg/kg
Indeno(1,2,3-cd)pyrene	--	0.0205	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?	YES (copper)
Any sample > 2x Cleanup Limit?	NO

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

-- = not applicable
B = blank contamination (inorganic constituents)
C = Sample was </= 5X the blank concentration
DE = direct exposure
GW = groundwater
J = estimate
L = dilution indicating physical and chemical interference are present
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 J. D. Skoglie	**Date** 11/15/10	**Calc. No.** 0600X-CA-V0093	**Rev. No.** 0
Project 100-IU-2/6 Field Remediation	**Job No.** 14655	**Checked** T. E. Queen	**Date** 11/15/10
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 4 of 18

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 and staging pile areas, 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.

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

Analyte	Excavation	Staging Pile Area
	Duplicate Analysis	Duplicate Analysis
Aluminum	3.2%	1.7%
Barium	24.5%	1.3%
Calcium	9.0%	2.9%
Chromium	4.5%	21.3%
Copper	0.9%	51.7%
Iron	6.8%	11.2%
Magnesium	3.0%	5.5%
Manganese	9.7%	0.3%
Silicon	19.8%	11.6%
Sodium	0.8%	
Vanadium	2.0%	4.8%
Zinc	2.0%	***72.4%***

[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 J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
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1 **600-124 Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	EX-1	J1B8R1	9/13/10	1.76		0.970	58.7		0.485	0.210		0.194	1.05	B	1.94	0.125	B	0.194	8.87		0.194	6.86		1.94	11.7		0.970
6	Duplicate of J1B8R1	J1B8T3	9/13/10	1.90		0.730	75.1		0.365	0.223		0.146	0.907	B	1.46	0.122	B	0.146	9.28		0.146	6.68		1.46	11.8		0.730
7	EX-2	J1B8R2	9/13/10	1.66		0.865	61.3		0.432	0.232		0.173	1.09	B	1.73	0.135	B	0.173	10.0		0.173	6.92		1.73	10.7		0.865
8	EX-3	J1B8R3	9/13/10	1.86		0.799	65.5		0.399	0.249		0.160	1.31	B	1.60	0.164		0.160	9.71		0.160	6.47		1.60	11.8		0.799
9	EX-4	J1B8R4	9/13/10	1.99		0.652	69.3		0.326	0.261		0.130	1.20	B	1.30	0.140		0.130	10.7		0.130	6.45		1.30	11.2		0.652
10	EX-5	J1B8R5	9/13/10	1.97		0.759	69.2		0.380	0.255		0.152	1.26	B	1.52	0.129	B	0.152	9.86		0.152	6.47		1.52	11.1		0.759
11	EX-6	J1B8R6	9/13/10	2.42		0.721	61.0		0.360	0.255		0.144	1.32	B	1.44	0.103	B	0.144	13.1		0.144	5.60		1.44	13.6		0.721
12	EX-7	J1B8R7	9/13/10	2.01		0.787	73.3		0.394	0.281		0.157	1.28	B	1.57	0.140	B	0.157	10.2		0.157	7.05		1.57	12.2		0.787
13	EX-8	J1B8R8	9/13/10	1.98		0.670	70.9		0.335	0.255		0.134	1.01	B	1.34	0.150		0.134	8.99		0.134	6.74		1.34	12.2		0.670
14	EX-9	J1B8R9	9/13/10	2.07		0.773	63.2		0.386	0.239		0.155	1.26	B	1.55	0.288		0.155	10.4		0.155	6.20		1.55	11.6		0.773
15	EX-10	J1B8T0	9/13/10	2.05		0.733	63.4		0.366	0.229		0.147	1.06	B	1.47	0.124	B	0.147	8.34		0.147	6.29		1.47	11.7		0.733
16	EX-11	J1B8T1	9/13/10	2.02		0.762	55.5		0.381	0.232		0.152	1.11	B	1.52	0.122	B	0.152	9.57		0.152	6.79		1.52	12.0		0.762
17	EX-12	J1B8T2	9/13/10	2.20		0.798	61.7		0.399	0.252		0.160	1.25	B	1.60	0.118	B	0.160	9.78		0.160	5.57		1.60	11.5		0.798

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	EX-1	J1B8R1/ J1B8T3	9/13/10	1.83	66.9	0.217	0.979	0.124	9.08	6.77	11.8
23	EX-2	J1B8R2	9/13/10	1.66	61.3	0.232	1.09	0.135	10.0	6.92	10.7
24	EX-3	J1B8R3	9/13/10	1.86	65.5	0.249	1.31	0.164	9.71	6.47	11.8
25	EX-4	J1B8R4	9/13/10	1.99	69.3	0.261	1.20	0.140	10.7	6.45	11.2
26	EX-5	J1B8R5	9/13/10	1.97	69.2	0.255	1.26	0.129	9.86	6.47	11.1
27	EX-6	J1B8R6	9/13/10	2.42	61.0	0.255	1.32	0.103	13.1	5.60	13.6
28	EX-7	J1B8R7	9/13/10	2.01	73.3	0.281	1.28	0.140	10.2	7.05	12.2
29	EX-8	J1B8R8	9/13/10	1.98	70.9	0.255	1.01	0.150	8.99	6.74	12.2
30	EX-9	J1B8R9	9/13/10	2.07	63.2	0.239	1.26	0.288	10.4	6.20	11.6
31	EX-10	J1B8T0	9/13/10	2.05	63.4	0.229	1.06	0.124	8.34	6.29	11.7
32	EX-11	J1B8T1	9/13/10	2.02	55.5	0.232	1.11	0.122	9.57	6.79	12.0
33	EX-12	J1B8T2	9/13/10	2.20	61.7	0.252	1.25	0.118	9.78	5.57	11.5

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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat normal distribution.	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	2.01	65.1	0.246	1.18	0.145	10.0	6.44	11.8
40	Standard deviation	0.188	5.05	0.0174	0.121	0.0478	1.18	0.474	0.726
41	95% UCL on mean	2.11	67.9	0.256	1.25	0.167	10.5	6.69	12.2
42	Maximum value	2.42	75.1	0.281	1.32	0.288	13.1	7.05	13.6
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 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	NA	NA	NO	NA	NA	NA	NA
46	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
47	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
48	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the 3-part test is not required.	Because all values are below background (132 mg/kg) the 3-part test is not required.	Because all values are below background (1.51 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.

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

CALCULATION SHEET

Date 11/15/10
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Checked T. E. Queen

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1 **600-124 Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	EX-1	J1B8R1	9/13/10	2.55		0.485	305		4.85	0.503	B	1.94	9.11		3.88	71.3		2.42	41.0		9.70
6	Duplicate of J1B8R1	J1B8T3	9/13/10	2.45		0.365	336		3.65	0.431	B	1.46	10.6		2.92	69.9		1.83	40.2		7.30
7	EX-2	J1B8R2	9/13/10	2.65		0.432	331		4.32	0.515	B	1.73	9.93		3.46	73.8		2.16	41.2		8.65
8	EX-3	J1B8R3	9/13/10	3.79		0.399	316		3.99	0.482	B	1.60	8.51		3.20	65.9		2.00	44.7		7.99
9	EX-4	J1B8R4	9/13/10	3.14		0.326	322		3.26	0.433	B	1.30	9.48		2.61	63.7		1.63	42.5		6.52
10	EX-5	J1B8R5	9/13/10	2.90		0.380	319		3.80	0.423	B	1.52	8.94		3.04	68.0		1.90	40.2		7.59
11	EX-6	J1B8R6	9/13/10	3.35		0.360	286		3.60	0.401	B	1.44	10.6		2.88	55.3		1.80	34.0		7.21
12	EX-7	J1B8R7	9/13/10	2.98		0.394	348		3.94	0.442	B	1.57	10.4		3.15	70.6		1.97	44.1		7.87
13	EX-8	J1B8R8	9/13/10	2.95		0.335	325		3.35	0.445	B	1.34	10.5		2.68	67.3		1.68	41.0		6.70
14	EX-9	J1B8R9	9/13/10	5.97		0.386	301		3.86	0.430	B	1.55	9.85		3.09	63.5		1.93	46.8		7.73
15	EX-10	J1B8T0	9/13/10	2.44		0.366	293		3.66	0.406	B	1.47	9.49		2.93	66.1		1.83	38.1		7.33
16	EX-11	J1B8T1	9/13/10	2.99		0.381	280		3.81	0.398	B	1.52	9.31		3.05	63.3		1.91	38.5		7.62
17	EX-12	J1B8T2	9/13/10	2.97		0.399	272		3.99	0.366	B	1.60	8.56		3.19	55.9		2.00	35.3		7.98

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	EX-1	J1B8R1/ J1B8T3	9/13/10	2.50	321	0.467	9.86	70.6	40.6
23	EX-2	J1B8R2	9/13/10	2.65	331	0.515	9.93	73.8	41.2
24	EX-3	J1B8R3	9/13/10	3.79	316	0.482	8.51	65.9	44.7
25	EX-4	J1B8R4	9/13/10	3.14	322	0.433	9.48	63.7	42.5
26	EX-5	J1B8R5	9/13/10	2.90	319	0.423	8.94	68.0	40.2
27	EX-6	J1B8R6	9/13/10	3.35	286	0.401	10.6	55.3	34.0
28	EX-7	J1B8R7	9/13/10	2.98	348	0.442	10.4	70.6	44.1
29	EX-8	J1B8R8	9/13/10	2.95	325	0.445	10.5	67.3	41.0
30	EX-9	J1B8R9	9/13/10	5.97	301	0.430	9.85	63.5	46.8
31	EX-10	J1B8T0	9/13/10	2.44	293	0.406	9.49	66.1	38.1
32	EX-11	J1B8T1	9/13/10	2.99	280	0.398	9.31	63.3	38.5
33	EX-12	J1B8T2	9/13/10	2.97	272	0.366	8.56	55.9	35.3

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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
37	N	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%
39	Mean	3.22	309	0.434	9.62	65.3	40.6
40	Standard deviation	0.940	22.9	0.0405	0.707	5.55	3.74
41	95% UCL on mean	3.67	322	0.456	10.0	68.5	42.7
42	Maximum value	5.97	348	0.515	10.6	73.8	46.8
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	NA	NO	NA	NA	NA
46	> 10% above Cleanup Limit?	NA	NA	NO	NA	NA	NA
47	Any sample > 2X Cleanup Limit?	NA	NA	NO	NA	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.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
Job No. 14655

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Checked T. E. Queen

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1 **600-124 Statistical Calculations**

2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SPA-1	J1B8T4	9/13/10	2.09		0.894	63.1		0.447	0.264		0.179	1.84		1.79	0.143	B	0.179	10.9		0.179	6.66		1.79	13.2		0.894
6	Duplicate of J1B8T4	J1B8V6	9/13/10	2.95		0.849	62.3		0.424	0.241		0.170	2.49		1.70	0.161	B	0.170	13.5		0.170	6.57		1.70	22.4		0.849
7	SPA-2	J1B8T5	9/13/10	2.75		0.778	61.1		0.389	0.256		0.156	4.31		1.56	0.164		0.156	17.0		0.156	6.08		1.56	27.1		0.778
8	SPA-3	J1B8T6	9/13/10	2.29		0.737	74.0		0.369	0.286		0.147	2.22		1.47	0.159		0.147	11.1		0.147	6.00		1.47	12.0		0.737
9	SPA-4	J1B8T7	9/13/10	1.86		0.741	54.8		0.371	0.230		0.148	1.11	B	1.48	0.121	B	0.148	9.96		0.148	6.56		1.48	12.9		0.741
10	SPA-5	J1B8T8	9/13/10	1.84		0.877	66.2		0.438	0.248		0.175	1.39	B	1.75	0.143	B	0.175	8.87		0.175	6.43		1.75	12.5		0.877
11	SPA-6	J1B8T9	9/13/10	1.94		0.886	65.6		0.443	0.256		0.177	1.71	B	1.77	0.150	B	0.177	9.98		0.177	6.43		1.77	12.0		0.886
12	SPA-7	J1B8V0	9/13/10	1.93		0.758	61.9		0.379	0.244		0.152	1.34	B	1.52	0.151	B	0.152	9.75		0.152	6.19		1.52	12.0		0.758
13	SPA-8	J1B8V1	9/13/10	1.85		0.735	62.2		0.367	0.229		0.147	1.44	B	1.47	0.158		0.147	12.2		0.147	6.54		1.47	12.2		0.735
14	SPA-9	J1B8V2	9/13/10	2.02		0.698	62.7		0.349	0.227		0.140	1.42		1.40	0.225		0.140	9.12		0.140	6.17		1.40	11.6		0.698
15	SPA-10	J1B8V3	9/13/10	2.48		0.890	71.6		0.445	0.258		0.178	1.43	B	1.78	0.164	B	0.178	10.1		0.178	6.87		1.78	11.6		0.890
16	SPA-11	J1B8V4	9/13/10	1.79		0.670	64.2		0.335	0.236		0.134	1.24	B	1.34	0.146		0.134	9.00		0.134	6.50		1.34	11.3		0.670
17	SPA-12	J1B8V5	9/13/10	1.56		0.656	53.4		0.328	0.206		0.131	0.839	B	1.31	0.134		0.131	9.87		0.131	6.53		1.31	12.0		0.656

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	SPA-1	J1B8T4/ J1B8V6	9/13/10	2.52	62.7	0.253	2.17	0.152	12.2	6.62	17.8
23	SPA-2	J1B8T5	9/13/10	2.75	61.1	0.256	4.31	0.164	17.0	6.08	27.1
24	SPA-3	J1B8T6	9/13/10	2.29	74.0	0.286	2.22	0.159	11.1	6.00	12.0
25	SPA-4	J1B8T7	9/13/10	1.86	54.8	0.230	1.11	0.121	10.0	6.56	12.9
26	SPA-5	J1B8T8	9/13/10	1.84	66.2	0.248	1.39	0.143	8.87	6.43	12.5
27	SPA-6	J1B8T9	9/13/10	1.94	65.6	0.256	1.71	0.150	10.0	6.43	12.0
28	SPA-7	J1B8V0	9/13/10	1.93	61.9	0.244	1.34	0.151	9.75	6.19	12.0
29	SPA-8	J1B8V1	9/13/10	1.85	62.2	0.229	1.44	0.158	12.2	6.54	12.2
30	SPA-9	J1B8V2	9/13/10	2.02	62.7	0.227	1.42	0.225	9.12	6.17	11.6
31	SPA-10	J1B8V3	9/13/10	2.48	71.6	0.258	1.43	0.164	10.1	6.87	11.6
32	SPA-11	J1B8V4	9/13/10	1.79	64.2	0.236	1.24	0.146	9.00	6.50	11.3
33	SPA-12	J1B8V5	9/13/10	1.56	53.4	0.206	0.839	0.134	9.87	6.53	12.0

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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
39	Mean	2.07	63.4	0.244	1.72	0.156	10.8	6.41	13.8
40	Standard deviation	0.357	5.85	0.0203	0.907	0.0251	2.26	0.252	4.54
41	95% UCL on mean	2.27	66.6	0.255	2.15	0.168	11.8	6.54	15.9
42	Maximum value	2.95	74.0	0.286	4.31	0.225	17.0	6.87	27.1
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 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	NA	NA	NO	NA	NA	NA	NO
46	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	YES
47	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO
48	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the 3-part test is not required.	Because all values are below background (132 mg/kg) the 3-part test is not required.	Because all values are below background (1.51 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.	A detailed assessment will be performed. The data set meets the 3-part test when compared to the direct exposure RAG.

Washington Closure Hanford

CALCULATION SHEET

Originator	J. D. Skoglie	Date	11/15/10
Project	100-IU-2/6 Field Remediation	Job No.	14655
Subject	600-124 Waste Site Cleanup Verification 95% UCL Calculations	Calc. No.	0600X-CA-V0093
		Checked	T. E. Queen
		Rev. No.	0
		Date	11/15/10
		Sheet No.	8 of 18

1 **600-124 Statistical Calculations**

2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc			TPH - motor oil			Benzo(a)anthracene		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-1	J1B8T4	9/13/10	4.67		0.447	303		4.47	0.411	B	1.79	12.2		3.58	64.0		2.24	41.3		8.94	10900		9900	1.28	J	3.35
6	Duplictae of J1B8T4	J1B8V6	9/13/10	4.41		0.424	302		4.24	1.63	B	1.70	13.5		3.40	61.0		2.12	88.2		8.49	12300	J	10200	1.94	J	3.19
7	SPA-2	J1B8T5	9/13/10	5.59		0.389	302		3.89	0.921	B	1.56	12.3		3.11	55.7		1.94	39.2		7.78	196000	D	49200	1.62	J	3.20
8	SPA-3	J1B8T6	9/13/10	5.00		0.369	311		3.69	0.394	B	1.47	9.33		2.95	55.8		1.84	42.2		7.37	11900		10100	0.955	J	3.35
9	SPA-4	J1B8T7	9/13/10	2.88		0.371	291		3.71	0.393	B	1.48	11.5		2.97	60.8		1.85	38.4		7.41	3900	J	10100	3.32	U	3.32
10	SPA-5	J1B8T8	9/13/10	3.08		0.438	308		4.38	0.400	B	1.75	8.64		3.51	65.8		2.19	40.5		8.77	10100	U	10100	1.33	J	3.36
11	SPA-6	J1B8T9	9/13/10	6.23		0.443	298		4.43	0.435	B	1.77	9.76		3.54	65.4		2.21	42.5		8.86	6550	J	9930	3.34	U	3.34
12	SPA-7	J1B8V0	9/13/10	3.70		0.379	279		3.79	0.402	B	1.52	9.78		3.03	62.6		1.89	42.8		7.58	15400		10100	1.89	J	3.29
13	SPA-8	J1B8V1	9/13/10	4.06		0.367	314		3.67	0.440	B	1.47	10.5		2.94	64.4		1.84	42.2		7.35	12400	J	10100	2.14	J	3.27
14	SPA-9	J1B8V2	9/13/10	6.24		0.349	290		3.49	0.448	B	1.40	9.66		2.79	64.9		1.74	45.4		6.98	30200	J	10000	6.73		3.27
15	SPA-10	J1B8V3	9/13/10	3.88		0.445	338		4.45	0.479	B	1.78	11.6		3.56	72.4		2.23	45.1		8.90	3530	J	10100	3.38	U	3.33
16	SPA-11	J1B8V4	9/13/10	2.93		0.335	310		3.35	0.424	B	1.34	10.4		2.68	68.2		1.68	42.7		6.70	9800	UJ	9800	3.34	U	3.34
17	SPA-12	J1B8V5	9/13/10	2.39		0.328	282		3.28	0.439	B	1.31	9.20		2.63	68.1		1.64	40.0		6.56	9900	UJ	9900	3.32	U	3.32

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH - motor oil	Benzo(a)anthracene
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg
22	SPA-1	J1B8T4/ J1B8V6	9/13/10	4.54	303	1.02	12.9	62.5	64.8	11600	1.61
23	SPA-2	J1B8T5	9/13/10	5.59	302	0.921	12.3	55.7	39.2	196000	1.62
24	SPA-3	J1B8T6	9/13/10	5.00	311	0.394	9.33	55.8	42.2	11900	0.96
25	SPA-4	J1B8T7	9/13/10	2.88	291	0.393	11.5	60.8	38.4	3900	1.66
26	SPA-5	J1B8T8	9/13/10	3.08	308	0.400	8.64	65.8	40.5	5050	1.33
27	SPA-6	J1B8T9	9/13/10	6.23	298	0.435	9.76	65.4	42.5	6550	1.67
28	SPA-7	J1B8V0	9/13/10	3.70	279	0.402	9.78	62.6	42.8	15400	1.89
29	SPA-8	J1B8V1	9/13/10	4.06	314	0.440	10.5	64.4	42.2	12400	2.14
30	SPA-9	J1B8V2	9/13/10	6.24	290	0.448	9.66	64.9	45.4	30200	6.73
31	SPA-10	J1B8V3	9/13/10	3.88	338	0.479	11.6	72.4	45.1	3530	1.67
32	SPA-11	J1B8V4	9/13/10	2.93	310	0.424	10.4	68.2	42.7	4900	1.67
33	SPA-12	J1B8V5	9/13/10	2.39	282	0.439	9.20	68.1	40.0	4950	1.66

34 **Statistical Computations**

35		Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH - motor oil	Benzo(a)anthracene
36	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), 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.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	25%	42%
39	Mean	4.21	302	0.516	10.5	63.9	43.8	25532	2.05
40	Standard deviation	1.32	16.0	0.215	1.32	4.88	6.93	54203	1.50
41	95% UCL on mean	5.09	311	0.618	11.2	66.6	47.1	51271	2.76
42	Maximum value	6.24	338	1.63	13.5	72.4	88.2	196000	6.73
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise**	10.2 GW & River Protection	512 GW & River Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	200000 ug/kg DE, GW & River Protection	15 ug/kg GW & River Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NA	NA	NO	NA	NA	NO	NO	NO
46	> 10% above Cleanup Limit?	NA	NA	NO	NA	NA	NO	NO	NO
47	Any sample > 2X Cleanup Limit?	NA	NA	NO	NA	NA	NO	NO	NO
48	**WAC 173-340 Compliance?**	Because all values are below background (10.2 mg/kg) the 3-part test is not required.	Because all values are below background (512 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 (19.1 mg/kg) the 3-part test is not required.	Because all values are below background (85.1 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.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
Job No. 14655

Calc. No. 0600X-CA-V0093
Checked T. E. Queen

Rev. No. 0
Date 11/15/10
Sheet No. 9 of 18

1 **600-124 Statistical Calculations**
2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene			Chrysene			Fluoranthene			Phenanthrene			Pyrene		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-1	J1B8T4	9/13/10	1.68	J	3.35	2.25	J	3.35	2.03	J	3.35	2.43	J	3.35	3.51		3.35	1.24	J	3.35	3.32	J	3.35
6	Duplictae of J1B8T4	J1B8V6	9/13/10	1.45	J	3.19	4.07		3.19	1.69	J	3.19	2.12	J	3.19	2.97	J	3.19	1.53	J	3.19	3.16	J	3.19
7	SPA-2	J1B8T5	9/13/10	1.72	J	3.20	3.21		3.20	2.28	J	3.2	1.62	J	3.20	11.0		3.20	2.97	J	3.20	5.05		3.20
8	SPA-3	J1B8T6	9/13/10	1.61	J	3.35	2.85	J	3.35	1.41	J	3.35	1.36	J	3.35	2.46	J	3.35	1.63	J	3.35	3.94		3.35
9	SPA-4	J1B8T7	9/13/10	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32
10	SPA-5	J1B8T8	9/13/10	1.14	J	3.36	1.36	J	3.36	1.78	J	3.36	3.36	U	3.36	2.71	J	3.36	3.36	U	3.36	1.55	J	3.36
11	SPA-6	J1B8T9	9/13/10	3.34	U	3.34	1.74	J	3.34	3.34	U	3.34	1.80	J	3.34	2.34	J	3.34	0.902	J	3.34	3.04	J	3.34
12	SPA-7	J1B8V0	9/13/10	2.53	J	3.29	3.50		3.29	3.19	J	3.29	4.56		3.29	4.56		3.29	1.48	J	3.29	6.15		3.29
13	SPA-8	J1B8V1	9/13/10	1.70	J	3.27	3.03	J	3.27	1.69	J	3.27	2.00	J	3.27	5.88		3.27	2.32	J	3.27	4.14		3.27
14	SPA-9	J1B8V2	9/13/10	7.58		3.27	11.1		3.27	8.87		3.33	4.37		3.27	17.1		3.27	7.23		3.27	17.0		3.27
15	SPA-10	J1B8V3	9/13/10	3.38	U	3.38	3.38	U	3.38	3.38	U	3.38	3.38	U	3.33	3.38	U	3.33	3.38	U	3.33	3.38	U	3.33
16	SPA-11	J1B8V4	9/13/10	3.34	U	3.34	3.34	U	3.34	5.68		3.38	3.34	U	3.34	3.34	U	3.38	3.34	U	3.38	3.34	U	3.34
17	SPA-12	J1B8V5	9/13/10	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.32	3.32	U	3.34	3.32	U	3.32

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Chrysene	Fluoranthene	Phenanthrene	Pyrene
21	Area	Number	Date	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
22	SPA-1	J1B8T4/ J1B8V6	9/13/10	1.57	3.16	1.86	2.28	3.24	1.39	3.24
23	SPA-2	J1B8T5	9/13/10	1.72	3.21	2.28	1.62	11.0	2.97	5.05
24	SPA-3	J1B8T6	9/13/10	1.61	2.85	1.41	1.36	2.46	1.63	3.94
25	SPA-4	J1B8T7	9/13/10	1.66	1.66	1.66	1.66	1.66	1.66	1.66
26	SPA-5	J1B8T8	9/13/10	1.14	1.36	1.78	1.68	2.71	1.68	1.55
27	SPA-6	J1B8T9	9/13/10	1.67	1.74	1.67	1.80	2.34	0.90	3.04
28	SPA-7	J1B8V0	9/13/10	2.53	3.50	3.19	4.56	4.56	1.48	6.15
29	SPA-8	J1B8V1	9/13/10	1.70	3.03	1.69	2.00	5.88	2.32	4.14
30	SPA-9	J1B8V2	9/13/10	7.58	11.1	8.87	4.37	17.1	7.23	17.0
31	SPA-10	J1B8V3	9/13/10	1.69	1.69	1.69	1.67	1.67	1.67	1.67
32	SPA-11	J1B8V4	9/13/10	1.67	1.67	5.68	1.67	1.69	1.69	1.67
33	SPA-12	J1B8V5	9/13/10	1.66	1.66	1.66	1.66	1.66	1.67	1.66

34 **Statistical Computations**

35		Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Chrysene	Fluoranthene	Phenanthrene	Pyrene
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), 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.
37	N	12	12	12	12	12	12	12
38	% < Detection limit	42%	33%	33%	42%	33%	42%	33%
39	Mean	2.18	3.05	2.79	2.19	4.66	2.19	4.23
40	Standard deviation	1.73	2.65	2.25	1.08	4.75	1.66	4.30
41	95% UCL on mean	3.00	4.31	3.86	2.71	6.92	2.98	6.27
42	Maximum value	7.58	11.1	8.87	4.56	17.1	7.23	17.0
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise**	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48000 ug/kg GW Protection	100 ug/kg River Protection	18000 ug/kg River Protection	240000 ug/kg GW Protection	48000 ug/kg GW Protection
44	**WAC 173-340 3-PART TEST**							
45	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
46	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
47	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
48	**WAC 173-340 Compliance?**	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie	**Date** 11/15/10	**Calc. No.** 0600X-CA-V0093	**Rev. No.** 0
Project 100-IU-2/6 Field Remediation	**Job No.** 14655	**Checked** T. E. Queen	**Date** 11/15/10
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 10 of 18

Ecology Software (MTCAStat) Results, 600-124 Waste Site Excavation

Arsenic 95% UCL Calculation

DATA	ID
1.83	J1B8R1/ J1B8T3
1.66	J1B8R2
1.86	J1B8R3
1.99	J1B8R4
1.97	J1B8R5
2.42	J1B8R6
2.01	J1B8R7
1.98	J1B8R8
2.07	J1B8R9
2.05	J1B8T0
2.02	J1B8T1
2.20	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	2.01
Censored		Lognormal mean	2.01
Detection limit or PQL		Std. devn.	0.188
Method detection limit		Median	2.00
TOTAL	12	Min.	1.66
		Max.	2.42

Lognormal distribution? r-squared is: 0.926
Normal distribution? r-squared is: 0.918
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.11

Barium 95% UCL Calculation

DATA	ID
66.9	J1B8R1/ J1B8T3
61.3	J1B8R2
65.5	J1B8R3
69.3	J1B8R4
69.2	J1B8R5
61.0	J1B8R6
73.3	J1B8R7
70.9	J1B8R8
63.2	J1B8R9
63.4	J1B8T0
55.5	J1B8T1
61.7	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	65.1
Censored		Lognormal mean	65.1
Detection limit or PQL		Std. devn.	5.05
Method detection limit		Median	64.5
TOTAL	12	Min.	55.5
		Max.	73.3

Lognormal distribution? r-squared is: 0.966
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 67.9

Beryllium 95% UCL Calculation

DATA	ID
0.217	J1B8R1/ J1B8T3
0.232	J1B8R2
0.249	J1B8R3
0.261	J1B8R4
0.255	J1B8R5
0.255	J1B8R6
0.281	J1B8R7
0.255	J1B8R8
0.239	J1B8R9
0.229	J1B8T0
0.232	J1B8T1
0.252	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.246
Censored		Lognormal mean	0.246
Detection limit or PQL		Std. devn.	0.0174
Method detection limit		Median	0.251
TOTAL	12	Min.	0.217
		Max.	0.281

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.950
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.256

Boron 95% UCL Calculation

DATA	ID
0.98	J1B8R1/ J1B8T3
1.09	J1B8R2
1.31	J1B8R3
1.20	J1B8R4
1.26	J1B8R5
1.32	J1B8R6
1.28	J1B8R7
1.01	J1B8R8
1.26	J1B8R9
1.06	J1B8T0
1.11	J1B8T1
1.25	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	1.18
Censored		Lognormal mean	1.18
Detection limit or PQL		Std. devn.	0.121
Method detection limit		Median	1.23
TOTAL	12	Min.	0.98
		Max.	1.32

Lognormal distribution? r-squared is: 0.912
Normal distribution? r-squared is: 0.918
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.25

Cadmium 95% UCL Calculation

DATA	ID
0.124	J1B8R1/ J1B8T3
0.135	J1B8R2
0.164	J1B8R3
0.140	J1B8R4
0.129	J1B8R5
0.103	J1B8R6
0.140	J1B8R7
0.150	J1B8R8
0.288	J1B8R9
0.124	J1B8T0
0.122	J1B8T1
0.118	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.145
Censored		Lognormal mean	0.144
Detection limit or PQL		Std. devn.	0.0478
Method detection limit		Median	0.132
TOTAL	12	Min.	0.103
		Max.	0.288

Lognormal distribution? r-squared is: 0.747
Normal distribution? r-squared is: 0.613
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.167

Chromium 95% UCL Calculation

DATA	ID
9.08	J1B8R1/ J1B8T3
10.0	J1B8R2
9.71	J1B8R3
10.7	J1B8R4
9.86	J1B8R5
13.1	J1B8R6
10.2	J1B8R7
8.99	J1B8R8
10.4	J1B8R9
8.34	J1B8T0
9.57	J1B8T1
9.78	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	10.0
Censored		Lognormal mean	10.0
Detection limit or PQL		Std. devn.	1.18
Method detection limit		Median	9.82
TOTAL	12	Min.	8.34
		Max.	13.1

Lognormal distribution? r-squared is: 0.877
Normal distribution? r-squared is: 0.829
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 10.5

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/17/10
Job No. 14655

Calc. No. 0600X-CA-V0093
Checked T. E. Queen

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Date 11/17/10
Sheet No. 11 of 18

Ecology Software (MTCAStat) Results, 600-124 Waste Site Excavation

Cobalt 95% UCL Calculation

DATA	ID
	J1B8R1/
6.77	J1B8T3
6.92	J1B8R2
6.47	J1B8R3
6.45	J1B8R4
6.47	J1B8R5
5.60	J1B8R6
7.05	J1B8R7
6.74	J1B8R8
6.20	J1B8R9
6.29	J1B8T0
6.79	J1B8T1
5.57	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	6.44
Censored		Lognormal mean	6.45
Detection limit or PQL		Std. devn.	0.474
Method detection limit		Median	6.47
TOTAL	12	Min.	5.57
		Max.	7.05

Lognormal distribution? r-squared is: 0.891
Normal distribution? r-squared is: 0.909
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 6.69

Copper 95% UCL Calculation

DATA	ID
	J1B8R1/
11.8	J1B8T3
10.7	J1B8R2
11.8	J1B8R3
11.2	J1B8R4
11.1	J1B8R5
13.6	J1B8R6
12.2	J1B8R7
12.2	J1B8R8
11.6	J1B8R9
11.7	J1B8T0
12.0	J1B8T1
11.5	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	11.8
Censored		Lognormal mean	11.8
Detection limit or PQL		Std. devn.	0.726
Method detection limit		Median	11.7
TOTAL	12	Min.	10.7
		Max.	13.6

Lognormal distribution? r-squared is: 0.901
Normal distribution? r-squared is: 0.879
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.2

Lead 95% UCL Calculation

DATA	ID
	J1B8R1/
2.50	J1B8T3
2.65	J1B8R2
3.79	J1B8R3
3.14	J1B8R4
2.90	J1B8R5
3.35	J1B8R6
2.98	J1B8R7
2.95	J1B8R8
5.97	J1B8R9
2.44	J1B8T0
2.99	J1B8T1
2.97	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	3.22
Censored		Lognormal mean	3.21
Detection limit or PQL		Std. devn.	0.940
Method detection limit		Median	2.98
TOTAL	12	Min.	2.44
		Max.	5.97

Lognormal distribution? r-squared is: 0.768
Normal distribution? r-squared is: 0.652
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.67

Manganese 95% UCL Calculation

DATA	ID
	J1B8R1/
321	J1B8T3
331	J1B8R2
316	J1B8R3
322	J1B8R4
319	J1B8R5
286	J1B8R6
348	J1B8R7
325	J1B8R8
301	J1B8R9
293	J1B8T0
280	J1B8T1
272	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	309
Censored		Lognormal mean	310
Detection limit or PQL		Std. devn.	22.9
Method detection limit		Median	318
TOTAL	12	Min.	272
		Max.	348

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.961
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 322

Molybdenum 95% UCL Calculation

DATA	ID
	J1B8R1/
0.467	J1B8T3
0.515	J1B8R2
0.482	J1B8R3
0.433	J1B8R4
0.423	J1B8R5
0.401	J1B8R6
0.442	J1B8R7
0.445	J1B8R8
0.430	J1B8R9
0.406	J1B8T0
0.398	J1B8T1
0.366	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.434
Censored		Lognormal mean	0.434
Detection limit or PQL		Std. devn.	0.0405
Method detection limit		Median	0.432
TOTAL	12	Min.	0.366
		Max.	0.515

Lognormal distribution? r-squared is: 0.980
Normal distribution? r-squared is: 0.973
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.456

Nickel 95% UCL Calculation

DATA	ID
	J1B8R1/
9.86	J1B8T3
9.93	J1B8R2
8.51	J1B8R3
9.48	J1B8R4
8.94	J1B8R5
10.6	J1B8R6
10.4	J1B8R7
10.5	J1B8R8
9.85	J1B8R9
9.49	J1B8T0
9.31	J1B8T1
8.56	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	9.62
Censored		Lognormal mean	9.62
Detection limit or PQL		Std. devn.	0.707
Method detection limit		Median	9.67
TOTAL	12	Min.	8.51
		Max.	10.6

Lognormal distribution? r-squared is: 0.956
Normal distribution? r-squared is: 0.960
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.0

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 11/15/10 **Calc. No.** 0600X-CA-V0093 **Rev. No.** 0

Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** T. E. Queen **Date** 11/15/10

Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 12 of 18

Ecology Software (MTCAStat) Results, 600-124 Waste Site Excavation

Vanadium 95% UCL Calculation

DATA	ID
	J1B8R1/
70.6	J1B8T3
73.8	J1B8R2
65.9	J1B8R3
63.7	J1B8R4
68.0	J1B8R5
55.3	J1B8R6
70.6	J1B8R7
67.3	J1B8R8
63.5	J1B8R9
66.1	J1B8T0
63.3	J1B8T1
55.9	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	65.3
Censored		Lognormal mean	65.4
Detection limit or PQL		Std. devn.	5.55
Method detection limit		Median	66.0
TOTAL	12	Min.	55.3
		Max.	73.8

Lognormal distribution? r-squared is: 0.918

Normal distribution? r-squared is: 0.936

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 68.5

Zinc 95% UCL Calculation

DATA	ID
	J1B8R1/
40.6	J1B8T3
41.2	J1B8R2
44.7	J1B8R3
42.5	J1B8R4
40.2	J1B8R5
34.0	J1B8R6
44.1	J1B8R7
41.0	J1B8R8
46.8	J1B8R9
38.1	J1B8T0
38.5	J1B8T1
35.3	J1B8T2

Number of samples		Uncensored values	
Uncensored	12	Mean	40.6
Censored		Lognormal mean	40.6
Detection limit or PQL		Std. devn.	3.74
Method detection limit		Median	40.8
TOTAL	12	Min.	34.0
		Max.	46.8

Lognormal distribution? r-squared is: 0.974

Normal distribution? r-squared is: 0.982

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 42.7

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
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Ecology Software (MTCAStat) Results, 600-124 Waste Site Staging Pile Area

Arsenic 95% UCL Calculation

DATA	ID
2.52	J1B8T4/ J1B8V6
2.75	J1B8T5
2.29	J1B8T6
1.86	J1B8T7
1.84	J1B8T8
1.94	J1B8T9
1.93	J1B8V0
1.85	J1B8V1
2.02	J1B8V2
2.48	J1B8V3
1.79	J1B8V4
1.56	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.07
Censored		Lognormal mean	2.07
Detection limit or PQL		Std. devn.	0.357
Method detection limit		Median	1.94
TOTAL	12	Min.	1.56
		Max.	2.75

Lognormal distribution? r-squared is: 0.931
Normal distribution? r-squared is: 0.910
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.27

Barium 95% UCL Calculation

DATA	ID
62.7	J1B8T4/ J1B8V6
61.1	J1B8T5
74.0	J1B8T6
54.8	J1B8T7
66.2	J1B8T8
65.6	J1B8T9
61.9	J1B8V0
62.2	J1B8V1
62.7	J1B8V2
71.6	J1B8V3
64.2	J1B8V4
53.4	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	63.4
Censored		Lognormal mean	63.4
Detection limit or PQL		Std. devn.	5.85
Method detection limit		Median	62.7
TOTAL	12	Min.	53.4
		Max.	74.0

Lognormal distribution? r-squared is: 0.935
Normal distribution? r-squared is: 0.937
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 66.6

Beryllium 95% UCL Calculation

DATA	ID
0.253	J1B8T4/ J1B8V6
0.256	J1B8T5
0.286	J1B8T6
0.230	J1B8T7
0.248	J1B8T8
0.256	J1B8T9
0.244	J1B8V0
0.229	J1B8V1
0.227	J1B8V2
0.258	J1B8V3
0.236	J1B8V4
0.206	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.244
Censored		Lognormal mean	0.244
Detection limit or PQL		Std. devn.	0.0203
Method detection limit		Median	0.246
TOTAL	12	Min.	0.206
		Max.	0.286

Lognormal distribution? r-squared is: 0.948
Normal distribution? r-squared is: 0.946
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.255

Boron 95% UCL Calculation

DATA	ID
2.17	J1B8T4/ J1B8V6
4.31	J1B8T5
2.22	J1B8T6
1.11	J1B8T7
1.39	J1B8T8
1.71	J1B8T9
1.34	J1B8V0
1.44	J1B8V1
1.42	J1B8V2
1.43	J1B8V3
1.24	J1B8V4
0.839	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	1.72
Censored		Lognormal mean	1.71
Detection limit or PQL		Std. devn.	0.907
Method detection limit		Median	1.43
TOTAL	12	Min.	0.84
		Max.	4.31

Lognormal distribution? r-squared is: 0.873
Normal distribution? r-squared is: 0.692
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.15

Cadmium 95% UCL Calculation

DATA	ID
0.152	J1B8T4/ J1B8V6
0.164	J1B8T5
0.159	J1B8T6
0.121	J1B8T7
0.143	J1B8T8
0.150	J1B8T9
0.151	J1B8V0
0.158	J1B8V1
0.225	J1B8V2
0.164	J1B8V3
0.146	J1B8V4
0.134	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.156
Censored		Lognormal mean	0.156
Detection limit or PQL		Std. devn.	0.0251
Method detection limit		Median	0.152
TOTAL	12	Min.	0.121
		Max.	0.225

Lognormal distribution? r-squared is: 0.838
Normal distribution? r-squared is: 0.768
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.168

Chromium 95% UCL Calculation

DATA	ID
12.2	J1B8T4/ J1B8V6
17.0	J1B8T5
11.1	J1B8T6
10.0	J1B8T7
8.87	J1B8T8
10.0	J1B8T9
9.75	J1B8V0
12.2	J1B8V1
9.12	J1B8V2
10.1	J1B8V3
9.00	J1B8V4
9.87	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	10.8
Censored		Lognormal mean	10.8
Detection limit or PQL		Std. devn.	2.26
Method detection limit		Median	10.0
TOTAL	12	Min.	8.87
		Max.	17.0

Lognormal distribution? r-squared is: 0.805
Normal distribution? r-squared is: 0.730
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 11.8

CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
Job No. 14655

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Ecology Software (MTCAStat) Results, 600-124 Waste Site Staging Pile Area

Cobalt 95% UCL Calculation

DATA	ID
6.62	J1B8T4/ J1B8V6
6.08	J1B8T5
6.00	J1B8T6
6.56	J1B8T7
6.43	J1B8T8
6.43	J1B8T9
6.19	J1B8V0
6.54	J1B8V1
6.17	J1B8V2
6.87	J1B8V3
6.50	J1B8V4
6.53	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	6.41
Censored		Lognormal mean	6.41
Detection limit or PQL		Std. devn.	0.252
Method detection limit		Median	6.47
TOTAL	12	Min.	6.00
		Max.	6.87

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.944
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 6.54

Copper 95% UCL Calculation

DATA	ID
17.8	J1B8T4/ J1B8V6
27.1	J1B8T5
12.0	J1B8T6
12.9	J1B8T7
12.5	J1B8T8
12.0	J1B8T9
12.0	J1B8V0
12.2	J1B8V1
11.6	J1B8V2
11.6	J1B8V3
11.3	J1B8V4
12.0	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	13.8
Censored		Lognormal mean	13.7
Detection limit or PQL		Std. devn.	4.54
Method detection limit		Median	12.0
TOTAL	12	Min.	11.3
		Max.	27.1

Lognormal distribution? r-squared is: 0.581
Normal distribution? r-squared is: 0.519
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 15.9

Lead 95% UCL Calculation

DATA	ID
4.54	J1B8T4/ J1B8V6
5.59	J1B8T5
5.00	J1B8T6
2.88	J1B8T7
3.08	J1B8T8
6.23	J1B8T9
3.70	J1B8V0
4.06	J1B8V1
6.24	J1B8V2
3.88	J1B8V3
2.93	J1B8V4
2.39	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	4.21
Censored		Lognormal mean	4.23
Detection limit or PQL		Std. devn.	1.32
Method detection limit		Median	3.97
TOTAL	12	Min.	2.39
		Max.	6.24

Lognormal distribution? r-squared is: 0.968
Normal distribution? r-squared is: 0.952
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.09

Manganese 95% UCL Calculation

DATA	ID
303	J1B8T4/ J1B8V6
302	J1B8T5
311	J1B8T6
291	J1B8T7
308	J1B8T8
298	J1B8T9
279	J1B8V0
314	J1B8V1
290	J1B8V2
338	J1B8V3
310	J1B8V4
282	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	302
Censored		Lognormal mean	302
Detection limit or PQL		Std. devn.	16.0
Method detection limit		Median	302
TOTAL	12	Min.	279
		Max.	338

Lognormal distribution? r-squared is: 0.950
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 311

Molybdenum 95% UCL Calculation

DATA	ID
1.02	J1B8T4/ J1B8V6
0.921	J1B8T5
0.394	J1B8T6
0.393	J1B8T7
0.400	J1B8T8
0.435	J1B8T9
0.402	J1B8V0
0.440	J1B8V1
0.448	J1B8V2
0.479	J1B8V3
0.424	J1B8V4
0.439	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.516
Censored		Lognormal mean	0.514
Detection limit or PQL		Std. devn.	0.215
Method detection limit		Median	0.437
TOTAL	12	Min.	0.393
		Max.	1.02

Lognormal distribution? r-squared is: 0.635
Normal distribution? r-squared is: 0.580
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.618

Nickel 95% UCL Calculation

DATA	ID
12.9	J1B8T4/ J1B8V6
12.3	J1B8T5
9.33	J1B8T6
11.5	J1B8T7
8.64	J1B8T8
9.76	J1B8T9
9.78	J1B8V0
10.5	J1B8V1
9.66	J1B8V2
11.6	J1B8V3
10.4	J1B8V4
9.20	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	10.5
Censored		Lognormal mean	10.5
Detection limit or PQL		Std. devn.	1.32
Method detection limit		Median	10.1
TOTAL	12	Min.	8.64
		Max.	12.9

Lognormal distribution? r-squared is: 0.960
Normal distribution? r-squared is: 0.947
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.2

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
Job No. 14655

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Ecology Software (MTCAStat) Results, 600-124 Waste Site Staging Pile Area

Vanadium 95% UCL Calculation

DATA	ID
62.5	J1B8T4/ J1B8V6
55.7	J1B8T5
55.8	J1B8T6
60.8	J1B8T7
65.8	J1B8T8
65.4	J1B8T9
62.6	J1B8V0
64.4	J1B8V1
64.9	J1B8V2
72.4	J1B8V3
68.2	J1B8V4
68.1	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	63.9
Censored		Lognormal mean	63.9
Detection limit or PQL		Std. devn.	4.88
Method detection limit		Median	64.7
TOTAL	12	Min.	55.7
		Max.	72.4

Lognormal distribution? r-squared is: 0.942
Normal distribution? r-squared is: 0.952
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 66.6

Zinc 95% UCL Calculation

DATA	ID
64.8	J1B8T4/ J1B8V6
39.2	J1B8T5
42.2	J1B8T6
38.4	J1B8T7
40.5	J1B8T8
42.5	J1B8T9
42.8	J1B8V0
42.2	J1B8V1
45.4	J1B8V2
45.1	J1B8V3
42.7	J1B8V4
40.0	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	43.8
Censored		Lognormal mean	43.8
Detection limit or PQL		Std. devn.	6.93
Method detection limit		Median	42.4
TOTAL	12	Min.	38.4
		Max.	64.8

Lognormal distribution? r-squared is: 0.657
Normal distribution? r-squared is: 0.590
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 47.1

TPH - motor oil 95% UCL Calculation

DATA	ID
11600	J1B8T4/ J1B8V6
196000	J1B8T5
11900	J1B8T6
3900	J1B8T7
5050	J1B8T8
6550	J1B8T9
15400	J1B8V0
12400	J1B8V1
30200	J1B8V2
3530	J1B8V3
4900	J1B8V4
4950	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	25532
Censored		Lognormal mean	19733
Detection limit or PQL		Std. devn.	54203
Method detection limit		Median	9075
TOTAL	12	Min.	3530
		Max.	196000

Lognormal distribution? r-squared is: 0.811
Normal distribution? r-squared is: 0.404
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 51271

Benzo(a)anthracene 95% UCL Calculation

DATA	ID
1.61	J1B8T4/ J1B8V6
1.62	J1B8T5
0.955	J1B8T6
1.66	J1B8T7
1.33	J1B8T8
1.67	J1B8T9
1.89	J1B8V0
2.14	J1B8V1
6.73	J1B8V2
1.67	J1B8V3
1.67	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.05
Censored		Lognormal mean	2.00
Detection limit or PQL		Std. devn.	1.50
Method detection limit		Median	1.66
TOTAL	12	Min.	0.96
		Max.	6.73

Lognormal distribution? r-squared is: 0.654
Normal distribution? r-squared is: 0.459
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.76

Benzo(a)pyrene 95% UCL Calculation

DATA	ID
1.57	J1B8T4/ J1B8V6
1.72	J1B8T5
1.61	J1B8T6
1.66	J1B8T7
1.14	J1B8T8
1.67	J1B8T9
2.53	J1B8V0
1.70	J1B8V1
7.58	J1B8V2
1.69	J1B8V3
1.67	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.18
Censored		Lognormal mean	2.11
Detection limit or PQL		Std. devn.	1.73
Method detection limit		Median	1.67
TOTAL	12	Min.	1.14
		Max.	7.58

Lognormal distribution? r-squared is: 0.572
Normal distribution? r-squared is: 0.424
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.00

Benzo(b)fluoranthene 95% UCL Calculation

DATA	ID
3.16	J1B8T4/ J1B8V6
3.21	J1B8T5
2.85	J1B8T6
1.66	J1B8T7
1.36	J1B8T8
1.74	J1B8T9
3.50	J1B8V0
3.03	J1B8V1
11.1	J1B8V2
1.69	J1B8V3
1.67	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	3.05
Censored		Lognormal mean	2.96
Detection limit or PQL		Std. devn.	2.65
Method detection limit		Median	2.30
TOTAL	12	Min.	1.36
		Max.	11.1

Lognormal distribution? r-squared is: 0.795
Normal distribution? r-squared is: 0.553
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.31

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

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Date 11/15/10
Job No. 14655

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Ecology Software (MTCAStat) Results, 600-124 Waste Site Staging Pile Area

Benzo(ghi)perylene 95% UCL Calculation

DATA	ID
1.86	J1B8T4/ J1B8V6
2.28	J1B8T5
1.41	J1B8T6
1.66	J1B8T7
1.78	J1B8T8
1.67	J1B8T9
3.19	J1B8V0
1.69	J1B8V1
8.87	J1B8V2
1.69	J1B8V3
5.68	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.79
Censored		Lognormal mean	2.71
Detection limit or PQL		Std. devn.	2.25
Method detection limit		Median	1.74
TOTAL	12	Min.	1.41
		Max.	8.87

Lognormal distribution? r-squared is: 0.731
Normal distribution? r-squared is: 0.607
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.86

Chrysene 95% UCL Calculation

DATA	ID
2.28	J1B8T4/ J1B8V6
1.62	J1B8T5
1.36	J1B8T6
1.66	J1B8T7
1.68	J1B8T8
1.80	J1B8T9
4.56	J1B8V0
2.00	J1B8V1
4.37	J1B8V2
1.67	J1B8V3
1.67	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.19
Censored		Lognormal mean	2.18
Detection limit or PQL		Std. devn.	1.08
Method detection limit		Median	1.68
TOTAL	12	Min.	1.36
		Max.	4.56

Lognormal distribution? r-squared is: 0.723
Normal distribution? r-squared is: 0.635
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.71

Fluoranthene 95% UCL Calculation

DATA	ID
3.24	J1B8T4/ J1B8V6
11.0	J1B8T5
2.46	J1B8T6
1.66	J1B8T7
2.71	J1B8T8
2.34	J1B8T9
4.56	J1B8V0
5.88	J1B8V1
17.1	J1B8V2
1.67	J1B8V3
1.69	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	4.66
Censored		Lognormal mean	4.54
Detection limit or PQL		Std. devn.	4.75
Method detection limit		Median	2.59
TOTAL	12	Min.	1.66
		Max.	17.1

Lognormal distribution? r-squared is: 0.865
Normal distribution? r-squared is: 0.680
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 6.92

Phenanthrene 95% UCL Calculation

DATA	ID
1.39	J1B8T4/ J1B8V6
2.97	J1B8T5
1.63	J1B8T6
1.66	J1B8T7
1.68	J1B8T8
0.902	J1B8T9
1.48	J1B8V0
2.32	J1B8V1
7.23	J1B8V2
1.67	J1B8V3
1.69	J1B8V4
1.67	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.19
Censored		Lognormal mean	2.14
Detection limit or PQL		Std. devn.	1.66
Method detection limit		Median	1.67
TOTAL	12	Min.	0.902
		Max.	7.23

Lognormal distribution? r-squared is: 0.764
Normal distribution? r-squared is: 0.546
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.98

Pyrene 95% UCL Calculation

DATA	ID
3.24	J1B8T4/ J1B8V6
5.05	J1B8T5
3.94	J1B8T6
1.66	J1B8T7
1.55	J1B8T8
3.04	J1B8T9
6.15	J1B8V0
4.14	J1B8V1
17.0	J1B8V2
1.67	J1B8V3
1.67	J1B8V4
1.66	J1B8V5

Number of samples		Uncensored values	
Uncensored	12	Mean	4.23
Censored		Lognormal mean	4.11
Detection limit or PQL		Std. devn.	4.30
Method detection limit		Median	3.14
TOTAL	12	Min.	1.55
		Max.	17.0

Lognormal distribution? r-squared is: 0.864
Normal distribution? r-squared is: 0.610
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 6.27

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 11/15/10 **Calc. No.** 0600X-CA-V0093 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** T. E. Queen **Date** 11/15/10
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 17 of 18

Duplicate Analysis - 600-124 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-1	J1B8R1	9/13/10	5540		4.85	1.76		0.970	58.7		0.485	0.210		0.194	1.05	B	1.94	0.125	B	0.194	5100		97.0	8.87		0.194
Duplicate of J1B8R1	J1B8T3	9/13/10	5720		3.65	1.90		0.730	75.1		0.365	0.223		0.146	0.907	B	1.46	0.122	B	0.146	4660		73.0	9.28		0.146

Analysis:

	TDL	5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)	Yes (calc RPD)
	RPD	3.2%		24.5%				9.0%	4.5%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-124 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-1	J1B8R1	9/13/10	6.86		1.94	11.7		0.970	24400		19.4	2.55		0.485	4360		72.7	305		4.85	0.503	B	1.94	9.11		3.88
Duplicate of J1B8R1	J1B8T3	9/13/10	6.68		1.46	11.8		0.730	22800		14.6	2.45		0.365	4230		54.8	336		3.65	0.431	B	1.46	10.6		2.92

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		0.9%	6.8%		3.0%	9.7%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-124 Excavation

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1B8R1	9/13/10	923		388	648		1.94	264		48.5	71.3		2.42	41.0		9.70
Duplicate of J1B8R1	J1B8T3	9/13/10	869		292	531		1.46	262		36.5	69.9		1.83	40.2		7.30

Analysis:

	TDL	400	2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		19.8%	0.8%	2.0%	2.0%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-124 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/15/10
Job No. 14655

Calc. No. 0600X-CA-V0093
Checked T. E. Queen

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Duplicate Analysis - 600-124 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	J1B8T4	9/13/10	6870		4.47	2.09		0.894	63.1		0.447	0.264		0.179	1.84		1.79	0.143	B	0.179	4180		89.4	10.9		0.179
Duplictae of J1B8T4	J1B8V6	9/13/10	6990	J	4.24	2.95		0.849	62.3		0.424	0.241		0.170	2.49		1.70	0.161	B	0.170	4060		84.9	13.5		0.170

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)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)		Yes (calc RPD)	Yes (calc RPD)
	RPD	1.7%		1.3%				2.9%	21.3%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-124 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	J1B8T4	9/13/10	6.66		1.79	13.2		0.894	21900		17.9	4.67		0.447	4080		67.1	303		4.47	0.411	B	1.79	12.2		3.58
Duplictae of J1B8T4	J1B8V6	9/13/10	6.57		1.70	22.4		0.849	24500		17.0	4.41		0.424	3860		63.7	302		4.24	1.63	B	1.70	13.5		3.40

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		*51.7%*	11.2%		5.5%	0.3%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-124 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	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SPA-1	J1B8T4	9/13/10	1200		358	731		1.79	249		44.7	64.0		2.24	41.3		8.94	10900		9900	1.28	J	3.35	1.68	J	3.35
Duplictae of J1B8T4	J1B8V6	9/13/10	1220		340	821		1.70	258		42.4	61.0		2.12	88.2		8.49	12300		3.19	1.94	J	3.19	1.45	J	3.19

Analysis:

	TDL	400	2	50	2.5	1	5000	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)		
	RPD		11.6%		4.8%	*72.4%*			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 600-124 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Benzo(b)fluoranthene			Benzo(ghi)perylene			Chrysene			Fluoranthene			Phenanthrene			Pyrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SPA-1	J1B8T4	9/13/10	2.25	J	3.35	2.03	J	3.35	2.43	J	3.35	3.51		3.35	1.24	J	3.35	3.32	J	3.35
Duplictae of J1B8T4	J1B8V6	9/13/10	4.07		3.19	1.69	J	3.19	2.12	J	3.19	2.97	J	3.19	1.53	J	3.19	3.16	J	3.19

Analysis:

	TDL	15	15	15	15	15	15
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?						
	RPD						
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Attachment 1. 600-124 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-1	J1B8R1	9/13/10	5540		4.85	0.582	U	0.582	1.76		0.970	58.7		0.485	0.210		0.194
Duplicate of J1B8R1	J1B8T3	9/13/10	5720		3.65	0.438	U	0.438	1.90		0.730	75.1		0.365	0.223		0.146
EX-2	J1B8R2	9/13/10	5940		4.32	0.519	U	0.519	1.66		0.865	61.3		0.432	0.232		0.173
EX-3	J1B8R3	9/13/10	6280		3.99	0.479	U	0.479	1.86		0.799	65.5		0.399	0.249		0.160
EX-4	J1B8R4	9/13/10	6920		3.26	0.391	U	0.391	1.99		0.652	69.3		0.326	0.261		0.130
EX-5	J1B8R5	9/13/10	7020		3.80	0.456	U	0.456	1.97		0.759	69.2		0.380	0.255		0.152
EX-6	J1B8R6	9/13/10	7140		3.60	0.433	U	0.433	2.42		0.721	61.0		0.360	0.255		0.144
EX-7	J1B8R7	9/13/10	7840		3.94	0.472	U	0.472	2.01		0.787	73.3		0.394	0.281		0.157
EX-8	J1B8R8	9/13/10	6820		3.35	0.402	U	0.402	1.98		0.670	70.9		0.335	0.255		0.134
EX-9	J1B8R9	9/13/10	6340		3.86	0.464	U	0.464	2.07		0.773	63.2		0.386	0.239		0.155
EX-10	J1B8T0	9/13/10	5980		3.66	0.440	U	0.440	2.05		0.733	63.4		0.366	0.229		0.147
EX-11	J1B8T1	9/13/10	5920		3.81	0.457	U	0.457	2.02		0.762	55.5		0.381	0.232		0.152
EX-12	J1B8T2	9/13/10	7100		3.99	0.479	U	0.479	2.20		0.798	61.7		0.399	0.252		0.160
SPA-1	J1B8T4	9/13/10	6870		4.47	0.536	U	0.536	2.09		0.894	63.1		0.447	0.264		0.179
Duplicate of J1B8T4	J1B8V6	9/13/10	6990	J	4.24	0.286	BJ	0.510	2.95		0.849	62.3		0.424	0.241		0.170
SPA-2	J1B8T5	9/13/10	6800		3.89	0.467	U	0.467	2.75		0.778	61.1		0.389	0.256		0.156
SPA-3	J1B8T6	9/13/10	7970		3.69	0.442	U	0.442	2.29		0.737	74.0		0.369	0.286		0.147
SPA-4	J1B8T7	9/13/10	6040		3.71	0.445	U	0.445	1.86		0.741	54.8		0.371	0.230		0.148
SPA-5	J1B8T8	9/13/10	6460		4.38	0.526	U	0.526	1.84		0.877	66.2		0.438	0.248		0.175
SPA-6	J1B8T9	9/13/10	6730		4.43	0.531	U	0.531	1.94		0.886	65.6		0.443	0.256		0.177
SPA-7	J1B8V0	9/13/10	6310		3.79	0.455	U	0.455	1.93		0.758	61.9		0.379	0.244		0.152
SPA-8	J1B8V1	9/13/10	6880	J	3.67	0.441	UJ	0.441	1.85		0.735	62.2		0.367	0.229		0.147
SPA-9	J1B8V2	9/13/10	6330	J	3.49	0.419	UJ	0.419	2.02		0.698	62.7		0.349	0.227		0.140
SPA-10	J1B8V3	9/13/10	7300	J	4.45	0.534	UJ	0.534	2.48		0.890	71.6		0.445	0.258		0.178
SPA-11	J1B8V4	9/13/10	6720	J	3.35	0.402	UJ	0.402	1.79		0.670	64.2		0.335	0.236		0.134
SPA-12	J1B8V5	9/13/10	5940	J	3.28	0.394	UJ	0.394	1.56		0.656	53.4		0.328	0.206		0.131
Equipment Blank	J1B8V7	9/13/10	233	J	3.97	0.476	UJ	0.476	0.794	U	0.794	2.16		0.397	0.159	U	0.159

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 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 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-1	J1B8R1	9/13/10	1.05	B	1.94	0.125	B	0.194	5100		97.0	8.87		0.194	6.86		1.94
Duplicate of J1B8R1	J1B8T3	9/13/10	0.907	B	1.46	0.122	B	0.146	4660		73.0	9.28		0.146	6.68		1.46
EX-2	J1B8R2	9/13/10	1.09	B	1.73	0.135	B	0.173	4220		86.5	10.0		0.173	6.92		1.73
EX-3	J1B8R3	9/13/10	1.31	B	1.60	0.164		0.160	4050		79.9	9.71		0.160	6.47		1.60
EX-4	J1B8R4	9/13/10	1.20	B	1.30	0.140		0.130	3900		65.2	10.7		0.130	6.45		1.30
EX-5	J1B8R5	9/13/10	1.26	B	1.52	0.129	B	0.152	4170		75.9	9.86		0.152	6.47		1.52
EX-6	J1B8R6	9/13/10	1.32	B	1.44	0.103	B	0.144	4850		72.1	13.1		0.144	5.60		1.44
EX-7	J1B8R7	9/13/10	1.28	B	1.57	0.140	B	0.157	4430		78.7	10.2		0.157	7.05		1.57
EX-8	J1B8R8	9/13/10	1.01	B	1.34	0.150		0.134	3980		67.0	8.99		0.134	6.74		1.34
EX-9	J1B8R9	9/13/10	1.26	B	1.55	0.288		0.155	3930		77.3	10.4		0.155	6.20		1.55
EX-10	J1B8T0	9/13/10	1.06	B	1.47	0.124	B	0.147	3900		73.3	8.34		0.147	6.29		1.47
EX-11	J1B8T1	9/13/10	1.11	B	1.52	0.122	B	0.152	4450		76.2	9.57		0.152	6.79		1.52
EX-12	J1B8T2	9/13/10	1.25	B	1.60	0.118	B	0.160	3660		79.8	9.78		0.160	5.57		1.60
SPA-1	J1B8T4	9/13/10	1.84		1.79	0.143	B	0.179	4180		89.4	10.9		0.179	6.66		1.79
Duplictae of J1B8T4	J1B8V6	9/13/10	2.49		1.70	0.161	B	0.170	4060		84.9	13.5		0.170	6.57		1.70
SPA-2	J1B8T5	9/13/10	4.31		1.56	0.164		0.156	4060		77.8	17.0		0.156	6.08		1.56
SPA-3	J1B8T6	9/13/10	2.22		1.47	0.159		0.147	3490		73.7	11.1		0.147	6.00		1.47
SPA-4	J1B8T7	9/13/10	1.11	B	1.48	0.121	B	0.148	5000		74.1	9.96		0.148	6.56		1.48
SPA-5	J1B8T8	9/13/10	1.39	B	1.75	0.143	B	0.175	4010		87.7	8.87		0.175	6.43		1.75
SPA-6	J1B8T9	9/13/10	1.71	B	1.77	0.150	B	0.177	4030		88.6	9.98		0.177	6.43		1.77
SPA-7	J1B8V0	9/13/10	1.34	B	1.52	0.151	B	0.152	3940		75.8	9.75		0.152	6.19		1.52
SPA-8	J1B8V1	9/13/10	1.44	B	1.47	0.158		0.147	4280		73.5	12.2		0.147	6.54		1.47
SPA-9	J1B8V2	9/13/10	1.42		1.40	0.225		0.140	4080		69.8	9.12		0.140	6.17		1.40
SPA-10	J1B8V3	9/13/10	1.43	B	1.78	0.164	B	0.178	4330		89.0	10.1		0.178	6.87		1.78
SPA-11	J1B8V4	9/13/10	1.24	B	1.34	0.146		0.134	3950		67.0	9.00		0.134	6.50		1.34
SPA-12	J1B8V5	9/13/10	0.839	B	1.31	0.134		0.131	4430		65.6	9.87		0.131	6.53		1.31
Equipment Blank	J1B8V7	9/13/10	1.59	U	1.59	0.159	U	0.159	43.1	B	79.4	0.173		0.159	1.59	U	1.59

Attachment	1	Sheet No.	2 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 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-1	J1B8R1	9/13/10	11.7		0.970	24400		19.4	2.55		0.485	4360		72.7	305		4.85
Duplicate of J1B8R1	J1B8T3	9/13/10	11.8		0.730	22800		14.6	2.45		0.365	4230		54.8	336		3.65
EX-2	J1B8R2	9/13/10	10.7		0.865	24700		17.3	2.65		0.432	4340		64.8	331		4.32
EX-3	J1B8R3	9/13/10	11.8		0.799	22900		16.0	3.79		0.399	3910		59.9	316		3.99
EX-4	J1B8R4	9/13/10	11.2		0.652	22500		13.0	3.14		0.326	3950		48.9	322		3.26
EX-5	J1B8R5	9/13/10	11.1		0.759	22700		15.2	2.90		0.380	3880		56.9	319		3.80
EX-6	J1B8R6	9/13/10	13.6		0.721	20000		14.4	3.35		0.360	4030		54.1	286		3.60
EX-7	J1B8R7	9/13/10	12.2		0.787	24600		15.7	2.98		0.394	4320		59.0	348		3.94
EX-8	J1B8R8	9/13/10	12.2		0.670	23100		13.4	2.95		0.335	4060		50.3	325		3.35
EX-9	J1B8R9	9/13/10	11.6		0.773	21400		15.5	5.97		0.386	3850		58.0	301		3.86
EX-10	J1B8T0	9/13/10	11.7		0.733	21900		14.7	2.44		0.366	3790		55.0	293		3.66
EX-11	J1B8T1	9/13/10	12.0		0.762	21700		15.2	2.99		0.381	3890		57.2	280		3.81
EX-12	J1B8T2	9/13/10	11.5		0.798	19400		16.0	2.97		0.399	3310		59.9	272		3.99
SPA-1	J1B8T4	9/13/10	13.2		0.894	21900		17.9	4.67		0.447	4080		67.1	303		4.47
Duplictae of J1B8T4	J1B8V6	9/13/10	22.4		0.849	24500		17.0	4.41		0.424	3860		63.7	302		4.24
SPA-2	J1B8T5	9/13/10	27.1		0.778	24600		15.6	5.59		0.389	3670		58.3	302		3.89
SPA-3	J1B8T6	9/13/10	12.0		0.737	20000		14.7	5.00		0.369	3490		55.3	311		3.69
SPA-4	J1B8T7	9/13/10	12.9		0.741	21000		14.8	2.88		0.371	4100		55.6	291		3.71
SPA-5	J1B8T8	9/13/10	12.5		0.877	21800		17.5	3.08		0.438	3570		65.8	308		4.38
SPA-6	J1B8T9	9/13/10	12.0		0.886	21600		17.7	6.23		0.443	3740		66.4	298		4.43
SPA-7	J1B8V0	9/13/10	12.0		0.758	20700		15.2	3.70		0.379	3770		56.8	279		3.79
SPA-8	J1B8V1	9/13/10	12.2		0.735	22200		14.7	4.06		0.367	4320		55.1	314		3.67
SPA-9	J1B8V2	9/13/10	11.6		0.698	20800		14.0	6.24		0.349	3680		52.3	290		3.49
SPA-10	J1B8V3	9/13/10	11.6		0.890	23200		17.8	3.88		0.445	4030		66.8	338		4.45
SPA-11	J1B8V4	9/13/10	11.3		0.670	21800		13.4	2.93		0.335	3890		50.3	310		3.35
SPA-12	J1B8V5	9/13/10	12.0		0.656	21500		13.1	2.39		0.328	3930		49.2	282		3.28
Equipment Blank	J1B8V7	9/13/10	0.794	U	0.794	257		15.9	0.329	B	0.397	31.3	B	59.5	5.18		3.97

Attachment	1	Sheet No.	3 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Selenium			Silicon		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1B8R1	9/13/10	0.503	B	1.94	9.11		3.88	923		388	0.291	U	0.291	648		1.94
Duplicate of J1B8R1	J1B8T3	9/13/10	0.431	B	1.46	10.6		2.92	869		292	0.219	U	0.219	531		1.46
EX-2	J1B8R2	9/13/10	0.515	B	1.73	9.93		3.46	984		346	0.259	U	0.259	588		1.73
EX-3	J1B8R3	9/13/10	0.482	B	1.60	8.51		3.20	1050		320	0.240	U	0.240	652		1.60
EX-4	J1B8R4	9/13/10	0.433	B	1.30	9.48		2.61	1210		261	0.196	U	0.196	615		1.30
EX-5	J1B8R5	9/13/10	0.423	B	1.52	8.94		3.04	1230		304	0.228	U	0.228	613		1.52
EX-6	J1B8R6	9/13/10	0.401	B	1.44	10.6		2.88	1070		288	0.216	U	0.216	639		1.44
EX-7	J1B8R7	9/13/10	0.442	B	1.57	10.4		3.15	1360		315	0.236	U	0.236	746		1.57
EX-8	J1B8R8	9/13/10	0.445	B	1.34	10.5		2.68	1140		268	0.201	U	0.201	672		1.34
EX-9	J1B8R9	9/13/10	0.430	B	1.55	9.85		3.09	1070		309	0.232	U	0.232	643		1.55
EX-10	J1B8T0	9/13/10	0.406	B	1.47	9.49		2.93	961		293	0.220	U	0.220	526		1.47
EX-11	J1B8T1	9/13/10	0.398	B	1.52	9.31		3.05	913		305	0.229	U	0.229	502		1.52
EX-12	J1B8T2	9/13/10	0.366	B	1.60	8.56		3.19	1220		319	0.239	U	0.239	788		1.60
SPA-1	J1B8T4	9/13/10	0.411	B	1.79	12.2		3.58	1200		358	0.268	U	0.268	731		1.79
Duplictae of J1B8T4	J1B8V6	9/13/10	1.63	B	1.70	13.5		3.40	1220		340	0.255	U	0.255	821		1.70
SPA-2	J1B8T5	9/13/10	0.921	B	1.56	12.3		3.11	1670		311	0.233	U	0.233	729		1.56
SPA-3	J1B8T6	9/13/10	0.394	B	1.47	9.33		2.95	1230		295	0.221	U	0.221	595		1.47
SPA-4	J1B8T7	9/13/10	0.393	B	1.48	11.5		2.97	942		297	0.222	U	0.222	593		1.48
SPA-5	J1B8T8	9/13/10	0.400	B	1.75	8.64		3.51	1060		351	0.263	U	0.263	616		1.75
SPA-6	J1B8T9	9/13/10	0.435	B	1.77	9.76		3.54	1140		354	0.266	U	0.266	794		1.77
SPA-7	J1B8V0	9/13/10	0.402	B	1.52	9.78		3.03	1030		303	0.227	U	0.227	523		1.52
SPA-8	J1B8V1	9/13/10	0.440	B	1.47	10.5		2.94	1120		294	0.220	U	0.220	719		1.47
SPA-9	J1B8V2	9/13/10	0.448	B	1.40	9.66		2.79	1140		279	0.209	U	0.209	680		1.40
SPA-10	J1B8V3	9/13/10	0.479	B	1.78	11.6		3.56	1180		356	0.267	U	0.267	919		1.78
SPA-11	J1B8V4	9/13/10	0.424	B	1.34	10.4		2.68	1110		268	0.201	U	0.201	703		1.34
SPA-12	J1B8V5	9/13/10	0.439	B	1.31	9.20		2.63	881		263	0.197	U	0.197	622		1.31
Equipment Blank	J1B8V7	9/13/10	1.59	U	1.59	3.17	U	3.17	47.6	B	317	0.238	U	0.238	297		1.59

Attachment	1	Sheet No.	4 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Silver			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1B8R1	9/13/10	0.194	U	0.194	264		48.5	71.3		2.42	41.0		9.70
Duplicate of J1B8R1	J1B8T3	9/13/10	0.146	U	0.146	262		36.5	69.9		1.83	40.2		7.30
EX-2	J1B8R2	9/13/10	0.173	U	0.173	271		43.2	73.8		2.16	41.2		8.65
EX-3	J1B8R3	9/13/10	0.160	U	0.160	252		39.9	65.9		2.00	44.7		7.99
EX-4	J1B8R4	9/13/10	0.130	U	0.130	246		32.6	63.7		1.63	42.5		6.52
EX-5	J1B8R5	9/13/10	0.152	U	0.152	266		38.0	68.0		1.90	40.2		7.59
EX-6	J1B8R6	9/13/10	0.144	U	0.144	233		36.0	55.3		1.80	34.0		7.21
EX-7	J1B8R7	9/13/10	0.157	U	0.157	280		39.4	70.6		1.97	44.1		7.87
EX-8	J1B8R8	9/13/10	0.134	U	0.134	259		33.5	67.3		1.68	41.0		6.70
EX-9	J1B8R9	9/13/10	0.155	U	0.155	242		38.6	63.5		1.93	46.8		7.73
EX-10	J1B8T0	9/13/10	0.147	U	0.147	252		36.6	66.1		1.83	38.1		7.33
EX-11	J1B8T1	9/13/10	0.152	U	0.152	257		38.1	63.3		1.91	38.5		7.62
EX-12	J1B8T2	9/13/10	0.160	U	0.160	259		39.9	55.9		2.00	35.3		7.98
SPA-1	J1B8T4	9/13/10	0.179	U	0.179	249		44.7	64.0		2.24	41.3		8.94
Duplictac of J1B8T4	J1B8V6	9/13/10	0.170	U	0.170	258		42.4	61.0		2.12	88.2		8.49
SPA-2	J1B8T5	9/13/10	0.156	U	0.156	241		38.9	55.7		1.94	39.2		7.78
SPA-3	J1B8T6	9/13/10	0.147	U	0.147	244		36.9	55.8		1.84	42.2		7.37
SPA-4	J1B8T7	9/13/10	0.148	U	0.148	229		37.1	60.8		1.85	38.4		7.41
SPA-5	J1B8T8	9/13/10	0.175	U	0.175	249		43.8	65.8		2.19	40.5		8.77
SPA-6	J1B8T9	9/13/10	0.177	U	0.177	265		44.3	65.4		2.21	42.5		8.86
SPA-7	J1B8V0	9/13/10	0.152	U	0.152	248		37.9	62.6		1.89	42.8		7.58
SPA-8	J1B8V1	9/13/10	0.147	U	0.147	273		36.7	64.4		1.84	42.2		7.35
SPA-9	J1B8V2	9/13/10	0.140	U	0.140	261		34.9	64.9		1.74	45.4		6.98
SPA-10	J1B8V3	9/13/10	0.178	U	0.178	263		44.5	72.4		2.23	45.1		8.90
SPA-11	J1B8V4	9/13/10	0.134	U	0.134	248		33.5	68.2		1.68	42.7		6.70
SPA-12	J1B8V5	9/13/10	0.131	U	0.131	280		32.8	68.1		1.64	40.0		6.56
Equipment Blank	J1B8V7	9/13/10	0.159	U	0.159	8.33	B	39.7	0.330	B	1.98	1.00	B	7.94

Attachment	1	Sheet No.	5 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 Waste Site Verification Sample Results (PAH)

CONSTITUENT	EX-1 - J1B8R1, 9/13/10			Duplicate of J1B8R1 - J1B8T3, 9/13/10			EX-2 - J1B8R2, 9/13/10			EX-3 - J1B8R3, 9/13/10			EX-4 - J1B8R4, 9/13/10			EX-5 - J1B8R5, 9/13/10			EX-6 - J1B8R6, 9/13/10		
	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Acenaphthylene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Anthracene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Benzo(a)anthracene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	1.57	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Benzo(a)pyrene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	1.32	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Benzo(b)fluoranthene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	2.93	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Benzo(ghi)perylene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Benzo(k)fluoranthene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Chrysene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.60		3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Dibenz[a,h]anthracene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	0.917	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Fluoranthene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	2.63	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Fluorene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Indeno(1,2,3-cd)pyrene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Naphthalene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.33	U	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Phenanthrene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	1.77	J	3.33	3.28	U	3.28	3.36	U	3.36	3.15	U	3.15
Pyrene	3.28	U	3.28	3.35	U	3.35	3.33	U	3.33	3.85		3.33	0.970	J	0.970	3.36	U	3.36	3.15	U	3.15

CONSTITUENT	EX-7 - J1B8R7, 9/13/10			EX-8 - J1B8R8, 9/13/10			EX-9 - J1B8R9, 9/13/10			EX-10 - J1B8T0, 9/13/10			EX-11 - J1B8T1, 9/13/10			EX-12 - J1B8T2, 9/13/10		
	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	3.24	U	3.24	3.26	U	3.26	192	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Acenaphthylene	3.24	U	3.24	3.26	U	3.26	1410	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Anthracene	3.24	U	3.24	3.26	U	3.26	13.4	U	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Benzo(a)anthracene	3.24	U	3.24	3.26	U	3.26	11.4	JD	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Benzo(a)pyrene	3.24	U	3.24	3.26	U	3.26	18.3	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Benzo(b)fluoranthene	3.24	U	3.24	3.26	U	3.26	16.0	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Benzo(ghi)perylene	3.24	U	3.24	3.26	U	3.26	23.8	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Benzo(k)fluoranthene	3.24	U	3.24	3.26	U	3.26	7.31	JD	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Chrysene	3.24	U	3.24	3.26	U	3.26	26.1	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Dibenz[a,h]anthracene	3.24	U	3.24	3.26	U	3.26	4.05	JD	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Fluoranthene	3.24	U	3.24	3.26	U	3.26	76.1	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Fluorene	3.24	U	3.24	3.26	U	3.26	25.3	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Indeno(1,2,3-cd)pyrene	3.24	U	3.24	3.26	U	3.26	13.4	U	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Naphthalene	3.24	U	3.24	3.26	U	3.26	113	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Phenanthrene	3.24	U	3.24	3.26	U	3.26	156	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34
Pyrene	3.24	U	3.24	3.26	U	3.26	41.9	D	13.4	3.28	U	3.28	3.34	U	3.34	3.34	U	3.34

Attachment	1	Sheet No.	6 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 Waste Site Verification Sample Results (PAH)

CONSTITUENT	SPA-1 - J1B8T4, 9/13/10			Duplicate of J1B8T4 - J1B8V6, 9/13/10			SPA-2 - J1B8T5, 9/13/10			SPA-3 - J1B8T6, 9/13/10			SPA-4 - J1B8T7, 9/13/10			SPA-5 - J1B8T8, 9/13/10			SPA-6 - J1B8T9, 9/13/10		
	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	3.35	U	3.35	3.19	U	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	1.30	J	3.36	3.34	U	3.34
Acenaphthylene	3.35	U	3.35	3.19	U	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Anthracene	3.35	U	3.35	3.19	U	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Benzo(a)anthracene	1.28	J	3.35	1.94	J	3.19	1.62	J	3.20	0.955	J	3.35	3.32	U	3.32	1.33	J	3.36	3.34	U	3.34
Benzo(a)pyrene	1.68	J	3.35	1.45	J	3.19	1.72	J	3.20	1.61	J	3.35	3.32	U	3.32	1.14	J	3.36	3.34	U	3.34
Benzo(b)fluoranthene	2.25	J	3.35	4.07		3.19	3.21		3.20	2.85	J	3.35	3.32	U	3.32	1.36	J	3.36	1.74	J	3.34
Benzo(ghi)perylene	2.03	J	3.35	1.69	J	3.19	2.28	J	3.20	1.41	J	3.35	3.32	U	3.32	1.78	J	3.36	3.34	U	3.34
Benzo(k)fluoranthene	3.35	U	3.35	3.19	U	3.19	1.14	J	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Chrysene	2.43	J	3.35	2.12	J	3.19	1.62	J	3.20	1.36	J	3.35	3.32	U	3.32	3.36	U	3.36	1.80	J	3.34
Dibenz[a,h]anthracene	3.35	U	3.35	0.925	J	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Fluoranthene	3.51		3.35	2.97	J	3.19	11.0		3.20	2.46	J	3.35	3.32	U	3.32	2.71	J	3.36	2.34	J	3.34
Fluorene	3.35	U	3.35	3.19	U	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.33	J	3.36	3.34	U	3.34
Indeno(1,2,3-cd)pyrene	8.84		3.35	20.5		3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Naphthalene	3.35	U	3.35	3.19	U	3.19	3.20	U	3.20	3.35	U	3.35	3.32	U	3.32	3.36	U	3.36	3.34	U	3.34
Phenanthrene	1.24	J	3.35	1.53	J	3.19	2.97	J	3.20	1.63	J	3.35	3.32	U	3.32	3.36	U	3.36	0.902	J	3.34
Pyrene	3.32	J	3.35	3.16	J	3.19	5.05		3.20	3.94		3.35	3.32	U	3.32	1.55	J	3.36	3.04	J	3.34

CONSTITUENT	SPA-7 - J1B8V0, 9/13/10			SPA-8 - J1B8V1, 9/13/10			SPA-9 - J1B8V2, 9/13/10			SPA-10 - J1B8V3, 9/13/10			SPA-11 - J1B8V4, 9/13/10			SPA-12 - J1B8V5, 9/13/10		
	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	3.29	U	3.29	3.27	U	3.27	3.33	U	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Acenaphthylene	3.29	U	3.29	3.27	U	3.27	3.33	U	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Anthracene	3.29	U	3.29	3.27	U	3.27	3.33	U	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Benzo(a)anthracene	1.89	J	3.29	2.14	J	3.27	6.73		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Benzo(a)pyrene	2.53	J	3.29	1.70	J	3.27	7.58		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Benzo(b)fluoranthene	3.50		3.29	3.03	J	3.27	11.1		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Benzo(ghi)perylene	3.19	J	3.29	1.69	J	3.27	8.87		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Benzo(k)fluoranthene	1.35	J	3.29	1.05	J	3.27	4.67		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Chrysene	4.56		3.29	2.00	J	3.27	4.37		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Dibenz[a,h]anthracene	1.02	J	3.29	3.27	U	3.27	1.98	J	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Fluoranthene	4.56		3.29	5.88		3.27	17.1		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Fluorene	3.29	U	3.29	3.27	U	3.27	3.33	U	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Indeno(1,2,3-cd)pyrene	11.6		3.29	3.27	U	3.27	4.08		3.33	3.38	U	3.38	5.68		3.34	3.32	U	3.32
Naphthalene	3.29	U	3.29	3.27	U	3.27	3.33	U	3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Phenanthrene	1.48	J	3.29	2.32	J	3.27	7.23		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32
Pyrene	6.15		3.29	4.14		3.27	17.0		3.33	3.38	U	3.38	3.34	U	3.34	3.32	U	3.32

Attachment	1	Sheet No.	7 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Attachment 1. 600-124 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-1	J1B8R1	9/13/10	3160	U	3160	9500	U	9500
Duplicate of J1B8R1	J1B8T3	9/13/10	3320	U	3320	9950	U	9950
EX-2	J1B8R2	9/13/10	3320	U	3320	9950	U	9950
EX-3	J1B8R3	9/13/10	3250	U	3250	9760	U	9760
EX-4	J1B8R4	9/13/10	3340	U	3340	10000	U	10000
EX-5	J1B8R5	9/13/10	3390	U	3390	10200	U	10200
EX-6	J1B8R6	9/13/10	3270	U	3270	4220	J	9820
EX-7	J1B8R7	9/13/10	3300	U	3300	9910	U	9910
EX-8	J1B8R8	9/13/10	3270	U	3270	9820	U	9820
EX-9	J1B8R9	9/13/10	65100	U	65100	195000	U	195000
EX-10	J1B8T0	9/13/10	3190	U	3190	9560	U	9560
EX-11	J1B8T1	9/13/10	3340	U	3340	10000	U	10000
EX-12	J1B8T2	9/13/10	3350	U	3350	10100	U	10100
SPA-1	J1B8T4	9/13/10	3300	U	3300	10900		9900
Duplictae of J1B8T4	J1B8V6	9/13/10	3390	U	3.19	12300	J	10200
SPA-2	J1B8T5	9/13/10	16400	U	16400	196000	D	49200
SPA-3	J1B8T6	9/13/10	3360	U	3360	11900		10100
SPA-4	J1B8T7	9/13/10	3350	U	3350	3900	J	10100
SPA-5	J1B8T8	9/13/10	3380	U	3380	10100	U	10100
SPA-6	J1B8T9	9/13/10	3310	U	3310	6550	J	9930
SPA-7	J1B8V0	9/13/10	3370	U	3370	15400		10100
SPA-8	J1B8V1	9/13/10	3370	U	3370	12400	J	10100
SPA-9	J1B8V2	9/13/10	3340	U	3.33	30200	J	10000
SPA-10	J1B8V3	9/13/10	3380	U	3.38	3530	J	10100
SPA-11	J1B8V4	9/13/10	3270	U	3.34	9800	UJ	9800
SPA-12	J1B8V5	9/13/10	3300	U	3.32	9900	UJ	9900

Attachment	1	Sheet No.	8 of 8
Originator	J. D. Skoglie	Date	11/15/10
Checked	T. E. Queen	Date	11/15/10
Calc. No.	0600X-CA-V0093	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 600-124

Discipline: Environmental *Calculation No: 0600X-CA-V0094

Subject: 600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	J. D. Skoglie	T. E. Queen	B. L. Vedder	D. F. Obenauer	11/18/10

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/16/10	Calc. No.:	0600X-CA-V0094	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	11/16/10
Subject:	600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					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 600-124 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

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

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

3) WCH, 2010, 600-124 *Waste Site Cleanup Verification 95% UCL Calculations*, (0600X-CA-V0093), Rev 0, 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 2005).

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 2009).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/16/10	Calc. No.:	0600X-CA-V0094	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	11/16/10
Subject:	600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The 600-124 Waste Site consisted of an excavation area and a staging pile area for the purpose of verification sampling.

Direct contact hazard quotient and carcinogenic risk calculations for the 600-124 waste site were conservatively calculated for the entire waste site using the greater of the statistically determined values for each analyte from WCH (2010). Boron, molybdenum, and the detected polycyclic aromatic hydrocarbons 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 2.15 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 3.0×10^{-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 2.3×10^{-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, and then multiplied by 1×10^{-6}. For example, the maximum value for chrysene is 0.0261 mg/kg; divided by 13.7 mg/kg, and multiplied as indicated, is 1.9×10^{-9}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk 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 1.8×10^{-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 calculations.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/16/10	Calc. No.:	0600X-CA-V0094	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	11/16/10
Subject:	600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 600-124 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	2.15	7,200	3.0E-04	--	--
Molybdenum	0.618	400	1.5E-03	--	--
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.192	4,800	4.0E-05	--	--
Acenaphthylene[c]	1.41	4,800	2.9E-04	--	--
Benzo(a)anthracene	0.0114	--	--	1.37	8.3E-09
Benzo(a)pyrene	0.0183	--	--	0.137	1.3E-07
Benzo(b)fluoranthene	0.0160	--	--	1.37	1.2E-08
Benzo(ghi)perylene[c]	0.0238	2,400	9.9E-06	--	--
Benzo(k)fluoranthene	0.00731	--	--	1.37	5.3E-09
Chrysene	0.0261	--	--	13.7	1.9E-09
Dibenz(a,h)anthracene	0.00405	--	--	1.37	3.0E-09
Fluoranthene	0.0761	3,200	2.4E-05	--	--
Fluorene	0.0253	3,200	7.9E-06	--	--
Indeno(1,2,3-cd)pyrene	0.0205	--	--	1.37	1.5E-08
Naphthalene	0.113	1,600	7.1E-05	--	--
Phenanthrene[c]	0.156	24,000	6.5E-06	--	--
Pyrene	0.0419	2,400	1.7E-05	--	--
Total Petroleum Hydrocarbons					
Motor oil[d]	51.3	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**2.3E-03**		
Cumulative Excess Cancer Risk:					**1.8E-07**

Notes:

[a] = From WCH (2010).

[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. The cleanup levels are based on use of surrogate chemicals.

acenaphthylene surrogate: acenaphthene

benzo(g,h,i)perylene surrogate: pyrene

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:

This calculation demonstrates that the 600-124 waste site meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009).

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CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 600-124

Discipline: Environmental *Calculation No: 0600X-CA-V0094

Subject: 600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	J. D. Skoglie	T. E. Queen	B. L. Vedder	D. F. Obenauer	11/18/10

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/16/10	Calc. No.:	0600X-CA-V0094	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	11/16/10
Subject:	600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					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 600-124 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

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3) WCH, 2010, 600-124 *Waste Site Cleanup Verification 95% UCL Calculations*, (0600X-CA-V0093), Rev 0, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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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 2009).

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Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/16/10	Calc. No.:	0600X-CA-V0094	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	11/16/10
Subject:	600-124 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The 600-124 Waste Site consisted of an excavation area and a staging pile area for the purpose of verification sampling.

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1) For example, the maximum value for boron is 2.15 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 3.0×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

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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 calculations.

APPENDIX C

WASTE CHARACTERIZATION

AND

IN-PROCESS ANALYTICAL DATA

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Metals																		
Aluminum	3580		3.74	5450		3.73	4740		3.42	3910		4.55	4140		5	121		4.10
Antimony	0.449	U	0.449	0.448	U	0.448	0.41	U	0.41	2.1		1.64	1.8	U	1.8	0.492	U	0.492
Arsenic	1.69		0.749	1.33		0.746	0.988		0.684	24.2		0.909	21.7		1	0.820	U	0.820
Barium	528		0.374	67		0.373	53.1		0.342	2590		0.455	3310		0.5	2.45		0.410
Beryllium	0.163		0.15	0.172		0.149	0.139		0.137	0.106	B	0.182	0.118	B	0.2	0.164	U	0.164
Boron	5.94		1.5	1	B	1.49	0.602	B	1.37	1.41	B	1.82	1.87	B	2	1.64	U	1.64
Cadmium	0.426		0.15	0.41		0.149	0.258		0.137	5.99		0.182	6.26		0.2	0.164	U	0.164
Calcium	3570		74.9	3820		74.6	3050		68.4	5110		90.9	3730		100	24.0	B	82.0
Chromium	15.2		0.15	7.86		0.149	7.1		0.137	2500		0.273	1460		0.3	0.246	U	0.246
Cobalt	4.25		1.5	6.22		1.49	6.02		1.37	19.6		1.82	17.3		2	1.64	U	1.64
Copper	10.6		0.749	12.2		0.746	118		0.684	13.9		0.909	12		1	0.51	B	0.820
Iron	13600		15	19500		14.9	18800		13.7	16300		18.2	14000		20	224		16.4
Lead	177		0.374	11.3		0.373	7.97		0.342	11600		1.36	8230		1.5	1.10		0.410
Magnesium	2610		56.1	3580		56	3490		51.3	3030		68.2	2720		75	28.7	B	61.5
Manganese	168		3.74	273		3.73	256		3.42	215		4.55	192		5	5.69		4.10
Molybdenum	0.52	B	1.5	0.416	B	1.49	0.389	B	1.37	2.74		1.82	2		2	1.64	U	1.64
Nickel	6.77		2.99	10.5		2.99	7.87		2.73	11.1		3.64	6.52		4	3.28	U	3.28
Potassium	960		299	1120		299	837		273	1250		364	871		400	31.8	B	328
Selenium	0.284		0.225	0.224	U	0.224	0.205	U	0.205	3.19		0.909	2.71		1	0.820	U	0.820
Silicon	423		1.5	352		1.49	298		1.37	465		1.82	415		2	81.9		1.64
Silver	0.15	U	0.15	0.149	U	0.149	0.137	U	0.137	0.319		0.182	0.332		0.2	0.164	U	0.164
Sodium	132		37.4	169		37.3	156		34.2	166		45.5	138		50	41.0	U	41.0
Vanadium	41.5		1.87	59.2		1.87	57.4		1.71	41.8		2.27	38.7		2.5	0.208	B	2.05
Zinc	273		7.49	74.5		7.46	51.2		6.84	5530		27.3	4330		30	1.19	B	8.20
Mercury	0.0358		0.0296	0.0115	B	0.0273	0.00904	U	0.0243	0.0273		0.0273	0.03	U	0.03	0.024	U	0.024

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)																		
1,2,4-Trichlorobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
1,2-Dichlorobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
1,3-Dichlorobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
1,4-Dichlorobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2,4,5-Trichlorophenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2,4,6-Trichloropenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2,4-Dichlorophenol	129	JD	672	2720	U	2720	667	U	667	27500	U	27500	27300	U	27300			
2,4-Dimethylphenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2,4-Dinitrophenol	3360	U	3360	13600	U	13600	3380	U	3380	137000	U	137000	136000	U	136000			
2,6-Dinitrotoluene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2-Chloronapthalene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2-Chlorophenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2-Methylnaphthalene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2-Methylphenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
2-Nitroaniline	3360	U	3360	13600	U	13600	3380	U	3380	137000	U	137000	136000	U	136000			
2-Nitrophenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
3,3'-Dichlorobenzidine	1340	U	1340	5440	U	5440	1350	U	1350	55000	U	55000	54600	U	54600			
3-Nitroaniline	3360	U	3360	13600	U	13600	3380	U	3380	137000	U	137000	136000	U	136000			
4,6-Dinitro-2-methylphenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
4-Bromophenyl Phenyl Ether	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
4-Chloro-3-methylphenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
4-Chloroaniline	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
4-Chlorophenyl Phenyl Ether	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
3- and/or 4-Methylphenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
4-Nitroaniline	3360	U	3360	13600	U	13600	3380	U	3380	137000	U	137000	136000	U	136000			
4-Nitrophenol	3360	U	3360	13600	U	13600	3380	U	3380	137000	U	137000	136000	U	136000			
Acenaphthene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)																		
Acenaphtylene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Antracene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Benz[a]anthracene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Benzo[a]pyrene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Benzo[b] fluoranthene	104	JD	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Benzo[g,h,i]perylene	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Benzo[k]fluoranthene	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Bis(2-chloroethoxy) methane	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Bis(2-chloroethyl) ether	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Bis(2-chloroisopropyl) ether	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Bis(2-ethylhexyl) phthalate	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Butyl Benzyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Carbazole	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Chrysene	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Dibenz[a,h]anthracene	351	U	351	351	U	351	353	U	353	350	U	350	351	U	351			
Dibenzofuran	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Diethyl Phthalate	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Dimethyl Phthalate	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Di-n-butyl Phthalate	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Di-n-octyl Phthalate	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Fluoranthene	149	JD	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Fluorene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Hexachlorobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Hexachlorobutadiene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Hexachlorocyclopentadiene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Hexachloroethane	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Indeno[1,2,3-cd]pyrene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)																		
Isophorone	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Napthalene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Nitrobenzene	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Ni-Nitrosodi-n-propylamine	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
N-Nitrosodiphenylamine	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Pentachlorophenol	672	U	672	13600	U	13600	3,380	U	3380	137000	U	137000	136000	U	136000			
Phenanthrene	176	JD	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Phenol	672	U	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Pyrene	116	JD	672	2720	U	2720	677	U	677	27500	U	27500	27300	U	27300			
Pesticides																		
alpha-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
gamma-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
beta-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
delta-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
Heptachlor	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
Aldrin	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43	1.41	U	1.41						
Heptachlor epoxide	13.4	D	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
gamma-Chlordane	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
alpha-Chlordane	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
Endosulfan I	26.5	D	1.36	1.68	JD	1.37	1.37	U	1.37	14.3	U	14.3						
4,4'-DDE	18	D	1.36	1.58	JD	1.37	1.37	U	1.37	218	D	14.3						
Dieldrin	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
Endrin	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
4,4'-DDD	1.36	U	1.36	1.41	JD	1.37	1.37	U	1.37	14.3	U	14.3						
Endosulfan II	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	75	JD	14.3						
4,4'-DDT	5.74	JD	1.36	1.37	U	1.37	1.37	U	1.37	22.9	JD	14.3						
Endrin aldehyde	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
Endosulfan sulfate	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides																		
Methoxychlor	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
Endrin ketone	1.36	U	1.36	1.37	U	1.37	1.37	U	1.37	14.3	U	14.3						
Toxaphene	20.4	U	20.4	20.6	U	20.6	20.5	U	20.5	214	U	214						
Polychlorinated Biphenyls (PCBs)																		
Aroclor-1016	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	142	U	142	165	U	165			
Aroclor-1221	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	142	U	142	165	U	165			
Aroclor-1232	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	142	U	142	165	U	165			
Aroclor-1242	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	142	U	142	165	U	165			
Aroclor-1248	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	142	U	142	165	U	165			
Aroclor-1254	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	351		142	999		165			
Aroclor-1260	13.5	U	13.5	13.7	U	13.7	13.6	U	13.6	322		142	513		165			
Volatile Organic Compounds (VOCs)																		
1,1,1-Trichloroethane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
1,1,2,2-Tetrachloroethane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
1,1,2-Trichloroethane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
1,1-Dichloroethane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
1,1-Dichloroethene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
1,2-Dichloroethane	5.99	U	5.99	5.52	U	5.52	5.33	U	5.33	5.77	U	5.77	5.77	U	5.77			
1,2-Dichloropropane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
2-Butanone	12.0	U	12.0	11.0	U	11.0	10.7	U	10.7	11.5	U	11.5	11.5	U	11.5			
2-Hexanone	12.0	U	12.0	11.0	U	11.0	10.7	U	10.7	11.5	U	11.5	11.5	U	11.5			
4-Methyl-2-pentanone	12.0	U	12.0	11.0	U	11.0	10.7	U	10.7	11.5	U	11.5	11.5	U	11.5			
Acetone	12.0	U	12.0	11.0	U	11.0	10.7	U	10.7	11.5	U	11.5	11.5	U	11.5			
Benzene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Bromodichloromethane	5.99	U	5.99	5.52	U	5.52	5.33	U	5.33	5.77	U	5.77	5.77	U	5.77			
Bromoform	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Bromomethane	9.98	U	9.98	9.20	U	9.20	8.88	U	8.88	9.62	U	9.62	9.62	U	9.62			
Carbon Disulfide	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			

Table C-1. 600-124 Waste Characterization Data. (6 Pages)

Constituent	J19CX1			J19CX2			J19CX3			J19FC2			J19FC3			J19FC4		
	12/14/2009			12/14/2009			12/14/2009			1/11/2010			1/11/2010			1/11/2010		
	Soil/Paint Aliquots			Tar/Soil Sample			Soil Aliquots			Paint Chips			Duplicate of J19FC2			Equipment Blank		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Volatile Organic Compounds (VOCs)																		
Carbon Tetrachloride	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Chlorobenzene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Chloroethane	9.98	U	9.98	9.20	U	9.20	8.88	U	8.88	9.62	U	9.62	9.62	U	9.62			
Chloroform	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Chloromethane	9.98	U	9.98	9.20	U	9.20	8.88	U	8.88	9.62	U	9.62	9.62	U	9.62			
cis-1,2-Dichloroethene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
cis-1,3-Dichloropropene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Dibromochloromethane	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Ethylbenzene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Methylene Chloride	5.99	U	5.99	5.52	U	5.52	5.33	U	5.33	5.77	U	5.77	5.77	U	5.77			
Styrene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Tetrachloroethene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
trans-1,2-Dichloroethene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Constituent	**J19CX1**			**J19CX2**			**J19CX3**			**J19FC2**			**J19FC3**			**J19FC4**		
	12/14/2009			**12/14/2009**			**12/14/2009**			**1/11/2010**			**1/11/2010**			**1/11/2010**		
	Soil/Paint Aliquots			**Tar/Soil Sample**			**Soil Aliquots**			**Paint Chips**			**Duplicate of J19FC2**			**Equipment Blank**		
	µg/kg	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**	**µg/kg**	**Q**	**PQL**
Volatile Organic Compounds (VOCs)																		
Toluene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
trans-1,3-Dichloropropene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Trichloroethene	4.99	U	4.99	4.60	U	4.60	4.44	U	4.44	4.81	U	4.81	4.81	U	4.81			
Vinyl chloride	9.98	U	9.98	9.20	U	9.20	8.88	U	8.88	9.62	U	9.62	9.62	U	9.62			
Xylenes, total	5.99	U	5.99	5.52	U	5.52	5.33	U	5.33	5.77	U	5.77	5.77	U	5.77			

Note: Gray cells indicate not applicable.

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

Table C-2. 600-124 In-Process Sample Data. (5 Pages)

Constituent	J19L18 Soil Aliquots 3/3/2010			J19L19 Soil Aliquots 3/3/2010			J19L20 Soil Aliquots 3/3/2010			J19L21 Duplicate of J19L18 3/3/2010			J19L21 Equipment Blank 3/3/2010		
	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Metals															
Aluminum	6480		4.09	6010		4.29	5740		3.82	5820		5	79.7		4.63
Antimony	0.491	U	0.491	0.515	U	0.515	0.459	U	0.459	0.599	U	0.599	0.556	U	0.556
Arsenic	1.7		0.818	1.5		0.858	1.68		0.764	1.45		0.999	0.926	U	0.926
Barium	62.8		0.409	66.3		0.429	58.8		0.382	58.4		0.5	0.898		0.463
Beryllium	0.169		0.164	0.176		0.172	0.164		0.153	0.165	B	0.2	0.185	U	0.185
Boron	0.973	B	1.64	1.14	B	1.72	1.19	B	1.53	0.869	B	2	1.85	U	1.85
Cadmium	0.153	B	0.164	0.156	B	0.172	0.162		0.153	0.137	B	0.2	0.185	U	0.185
Calcium	3840		81.8	3750		85.8	3360		76.4	3560		99.9	14.9	B	92.6
Chromium	9.24		0.164	9.77		0.172	8.77		0.153	8.42		0.2	0.185	U	0.185
Cobalt	6.65		1.64	7.25		1.72	6.39		1.53	6.36		2	1.85	U	1.85
Copper	12.2		0.818	11.7		0.858	11.4		0.764	10.8		0.999	0.926	U	0.926
Iron	21500		16.4	22500		17.2	19400		15.3	19900		20	124		18.5
Lead	3.24		0.409	5.18		0.429	5.43		0.382	2.91		0.5	0.463	U	0.463
Magnesium	4190		61.3	4240		64.4	3590		57.3	3660		74.9	8.57	B	69.5
Manganese	294		4.09	305		4.29	271		3.82	271		5	3.21	B	4.63
Molybdenum	0.42	B	1.64	0.414	B	1.72	0.339	B	1.53	0.319	B	2	1.85	U	1.85
Nickel	10		3.27	9.85		3.43	9.24		3.06	7.88		4	3.71	U	3.71
Potassium	1210		327	1090		343	1150		306	1020		400	23.0	B	371
Selenium	0.245	U	0.245	0.257	U	0.257	0.229	U	0.229	0.3	U	0.3	0.278	U	0.278
Silicon	531		1.64	475		1.72	431		1.53	395		2	85		1.85
Silver	0.164	U	0.164	0.172	U	0.172	0.153	U	0.153	0.2	U	0.2	0.185	U	0.185
Sodium	226		40.9	181		42.9	160		38.2	172		50	46.3	U	46.3
Vanadium	62.6		2.04	62.7		2.15	55.1		1.91	56.8		2.5	2.32	U	2.32
Zinc	42.6		8.18	47.4		8.58	42.9		7.64	39.3		9.99	9.26	U	9.26
Mercury	0.0273	U	0.0273	0.029	U	0.029	0.0283	U	0.0283	0.0265	U	0.0265	0.0273	U	0.027
Semivolatile Organic Compounds (SVOCs)															
Constituent	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
1,2,4-Trichlorobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
1,2-Dichlorobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
1,3-Dichlorobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
1,4-Dichlorobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
2,4,5-Trichlorophenol	351	U	351	351	U	351	353	U	353	350	U	350			
2,4,6-Trichloropenol	351	U	351	351	U	351	353	U	353	350	U	350			
2,4-Dichlorophenol	351	U	351	351	U	351	353	U	353	350	U	350			

Table C-2. 600-124 In-Process Sample Data. (5 Pages)

Constituent	J19L18			J19L19			J19L20			J19L21			J19L21		
	Soil Aliquots			Soil Aliquots			Soil Aliquots			Duplicate of J19L18			Equipment Blank		
	3/3/2010			3/3/2010			3/3/2010			3/3/2010			3/3/2010		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)															
2,4-Dimethylphenol	351	U	351	351	U	351	353	U	353	350	U	350			
2,4-Dinitrophenol	1750	U	1750	1760	U	1760	1,770	U	1770	1750	U	1750			
2,4-Dinitrotoluene	351	U	351	351	U	351	353	U	353	350	U	350			
2,6-Dinitrotoluene	351	U	351	351	U	351	353	U	353	350	U	350			
2-Chloronapthalene	351	U	351	351	U	351	353	U	353	350	U	350			
2-Chlorophenol	351	U	351	351	U	351	353	U	353	350	U	350			
2-Methylnaphthalene	351	U	351	351	U	351	353	U	353	350	U	350			
2-Methylphenol	351	U	351	351	U	351	353	U	353	350	U	350			
2-Nitroaniline	1750	U	1750	1760	U	1760	1770	U	1770	1750	U	1750			
2-Nitrophenol	351	U	351	351	U	351	353	U	353	350	U	350			
3,3'-Dichlorobenzidine	702	U	702	702	U	702	706	U	706	699	U	699			
3-Nitroaniline	1750	U	1750	1760	U	1760	1770	U	1770	1750	U	1750			
4,6-Dinitro-2-methylphenol	351	U	351	351	U	351	353	U	353	350	U	350			
4-Bromophenyl Phenyl Ether	351	U	351	351	U	351	353	U	353	350	U	350			
4-Chloro-3-methylphenol	351	U	351	351	U	351	353	U	353	350	U	350			
4-Chloroaniline	351	U	351	351	U	351	353	U	353	350	U	350			
4-Chlorophenyl Phenyl Ether	351	U	351	351	U	351	353	U	353	350	U	350			
3- and/or 4-Methylphenol	351	U	351	351	U	351	353	U	353	350	U	350			
4-Nitroaniline	1750	U	1750	1760	U	1760	1770	U	1770	1750	U	1750			
4-Nitrophenol	1750	U	1750	1760	U	1760	1770	U	1770	1750	U	1750			
Acenaphthene	351	U	351	351	U	351	353	U	353	350	U	350			
Acenaphtylene	351	U	351	351	U	351	353	U	353	350	U	350			
Antracene	351	U	351	351	U	351	353	U	353	350	U	350			
Benz[a]anthracene	351	U	351	351	U	351	353	U	353	350	U	350			
Benzo[a]pyrene	351	U	351	351	U	351	353	U	353	350	U	350			
Benzo[b] fluoranthene	351	U	351	351	U	351	353	U	353	350	U	350			
Benzo[g,h,i]perylene	351	U	351	351	U	351	353	U	353	350	U	350			
Benzo[k]fluoranthene	351	U	351	351	U	351	353	U	353	350	U	350			
Bis(2-chloroethoxy) methane	351	U	351	351	U	351	353	U	353	350	U	350			
Bis(2-chloroethyl) ether	351	U	351	351	U	351	353	U	353	350	U	350			
Bis(2-chloroisopropyl) ether	351	U	351	351	U	351	353	U	353	350	U	350			
Bis(2-ethylhexyl) phthalate	351	U	351	351	U	351	353	U	353	350	U	350			

Table C-2. 600-124 In-Process Sample Data. (5 Pages)

Constituent	J19L18			J19L19			J19L20			J19L21			J19L21		
	Soil Aliquots			Soil Aliquots			Soil Aliquots			Duplicate of J19L18			Equipment Blank		
	3/3/2010			3/3/2010			3/3/2010			3/3/2010			3/3/2010		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)															
Butyl Benzyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350			
Carbazole	351	U	351	351	U	351	353	U	353	350	U	350			
Chrysene	351	U	351	351	U	351	353	U	353	350	U	350			
Dibenz[a,h]anthracene	351	U	351	351	U	351	353	U	353	350	U	350			
Dibenzofuran	351	U	351	351	U	351	353	U	353	350	U	350			
Diethyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350			
Dimethyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350			
Di-n-butyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350			
Di-n-octyl Phthalate	351	U	351	351	U	351	353	U	353	350	U	350			
Fluoranthene	351	U	351	351	U	351	353	U	353	350	U	350			
Fluorene	351	U	351	351	U	351	353	U	353	350	U	350			
Hexachlorobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
Hexachlorobutadiene	351	U	351	351	U	351	353	U	353	350	U	350			
Hexachlorocyclopentadiene	351	U	351	351	U	351	353	U	353	350	U	350			
Hexachloroethane	351	U	351	351	U	351	353	U	353	350	U	350			
Indeno[1,2,3-cd]pyrene	351	U	351	351	U	351	353	U	353	350	U	350			
Isophorone	351	U	351	351	U	351	353	U	353	350	U	350			
Napthalene	351	U	351	351	U	351	353	U	353	350	U	350			
Nitrobenzene	351	U	351	351	U	351	353	U	353	350	U	350			
Ni-Nitrosodi-n-propylamine	351	U	351	351	U	351	353	U	353	350	U	350			
N-Nitrosodiphenylamine	351	U	351	351	U	351	353	U	353	350	U	350			
Pentachlorophenol	1750	U	1750	1760	U	1760	1770	U	1770	1750	U	1750			
Phenanthrene	351	U	351	351	U	351	353	U	353	350	U	350			
Phenol	351	U	351	351	U	351	353	U	353	350	U	350			
Pyrene	351	U	351	351	U	351	353	U	353	350	U	350			
Pesticides															
alpha-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
gamma-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
beta-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
delta-BHC	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Heptachlor	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						

Table C-2. 600-124 In-Process Sample Data. (5 Pages)

Constituent	J19L18			J19L19			J19L20			J19L21			J19L21		
	Soil Aliquots			Soil Aliquots			Soil Aliquots			Duplicate of J19L18			Equipment Blank		
	3/3/2010			3/3/2010			3/3/2010			3/3/2010			3/3/2010		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides															
Aldrin	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Heptachlor epoxide	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
gamma-Chlordane	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
alpha-Chlordane	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endosulfan I	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
4,4'-DDE	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Dieldrin	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endrin	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
4,4'-DDD	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endosulfan II	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
4,4'-DDT	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endrin aldehyde	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endosulfan sulfate	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Methoxychlor	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Endrin ketone	1.42	U	1.42	1.42	U	1.42	1.43	U	1.43						
Toxaphene	21.3	U	21.3	21.3	U	21.3	21.4	U	21.4						
Wet Chemistry															
Bromide	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7						
Chloride	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7						
Fluoride	0.8	B	2.7	0.6	B	2.7	15.7		2.7						
Nitrate	2.8		2.7	3.3		2.7	6.5		2.7						
Nitrite	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7						
Orthophosphate	2.7	U	2.7	2.7	U	2.7	6.5		2.7						
Sulfate	4.4		2.7	16.7		2.7	0.6	B	2.7						
Hexavalent Chromium	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21						
Cyanide	0.34	U	0.34	0.49	U	0.49	0.40	U	0.40						
Sulfide, total	11.2	B	21.3	8.8	B	21.3	10.9	B	21.4						
Total Petroleum Hydrocarbons (TPH)															
Diesel Range Organics	3510	U	3510	4640		3510	3450	J	3530						
Motor Oil	4800	J	10600	8870	J	10600	13400		10700						

Table C-2. 600-124 In-Process Sample Data. (5 Pages)

Constituent	J19L18			J19L19			J19L20			J19L21			J19L21		
	Soil Aliquots			Soil Aliquots			Soil Aliquots			Duplicate of J19L18			Equipment Blank		
	3/3/2010			3/3/2010			3/3/2010			3/3/2010			3/3/2010		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons (PAH)															
Napthalene	3.54	U	3.54	3.54	U	3.54	3.56	U	3.56						
Acenaphthylene	4.96		3.54	3.54	U	3.54	3.56	U	3.56						
Acenaphthene	3.54	U	3.54	3.54	U	3.54	3.56	U	3.56						
Fluorene	3.54	U	3.54	3.54	U	3.54	3.56	U	3.56						
Phenanthrene	3.54	U	3.54	1.95	J	3.54	15.7		3.56						
Anthracene	3.54	U	3.54	3.54	U	3.54	1.61	J	3.56						
Fluoranthene	2.66	J	3.54	5.85		3.54	75.1		3.56						
Indeno[1,2,3-cd]pyrene	0.992	J	3.54	3.74		3.54	17.4		3.56						
Pyrene	3.54	U	3.54	1.28	J	3.54	36.9		3.56						
Benz[a]anthracene	3.54	U	3.54	3.54	U	3.54	21.4		3.56						
Chrysene	3.54	U	3.54	2.15	J	3.54	20.3		3.56						
Benzo[b]fluoranthene	1.2	J	3.54	1.33	J	3.54	33.2		3.56						
Benzo[k]fluoranthene	3.54	U	3.54	3.54	U	3.54	12.3		3.56						
Benzo[a]pyrene	3.54	U	3.54	3.54	U	3.54	20.3		3.56						
Dibenz[a,h]anthracene	3.54	U	3.54	3.54	U	3.54	3.51	J	3.56						
Benzo[g,h,i]perylene	1.13	J	3.54	2.13	J	3.54	14.4		3.56						
Polychlorinated Biphenyls (PCBs)															
Aroclor-1016	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1221	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1232	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1242	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1248	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1254	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						
Aroclor-1260	14.1	U	14.1	14.2	U	14.2	14.2	U	14.2						

Note: Gray cells indicate not applicable.

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

APPENDIX D

DATA QUALITY ASSESSMENT

APPENDIX D

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 600-124 waste site were provided by the laboratory in two sample delivery groups (SDGs): SDG K2362 and SDG K2363. The SDG K2363 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 K2363

This SDG comprises six verification soil samples (J1B8V1-J1B8V6) from the 600-124 staging pile area. These samples were analyzed for inductively coupled plasma (ICP) metals, polycyclic aromatic hydrocarbons (PAH), and total petroleum hydrocarbons (TPH). In addition, one equipment blank (J1B8V7) was collected and analyzed for ICP metals. SDG K2363 was submitted for third-party validation. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2363 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 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 57%. All antimony data for SDG K2363 were considered estimated and flagged "J" by third-party validation due to the MS recovery outside the quality control (QC) limits. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for aluminum is above the QC limit at 140%. The aluminum results were considered estimated and flagged "J" by third party validation. The data are useable for decision-making purposes.

SDG K2362

This SDG comprises 13 verification soil samples (J1B8R1-J1B8R9, J1B8T0-J1B8T3) from the 600-124 excavation, and 7 verification soil samples (J1B8T4-J1B8T9, J1B8V0) from the 600-124 staging pile area. A field duplicate pair (J1B8R1/J1B8T3) is included in this SDG. These samples were analyzed for ICP metals, PAH, and TPH. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2362 may be considered estimated due to lack of a MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for three analytes (aluminum, iron, and antimony). For aluminum and iron 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 60%. All antimony data for SDG K2362 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for antimony is outside the QC limits at 133%. The antimony results may be considered estimated. The data are useable for decision-making purposes.

In the ICP metals analysis, the relative percent difference (RPD) for silicon is above the QC limit of 30% at 41%. The silicon results may be considered estimated. The data are useable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

The 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 the primary and duplicate samples from the excavation (J1B8R1/J1B8T3) and the primary and duplicate samples from the staging pile area (J1B8T4/J1B8V6). The main and QA/QC sample results are presented in Appendix C.

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). The RPDs are not calculated for analytes that are not detected in both the main and duplicate sample at more than 5 times the target detection limit. The RPDs of analytes detected at low concentrations (less than 5 times the detection limit) are not considered to be indicative of the analytical system performance. The upper confidence level (UCL) calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation.

The RPDs calculated for copper and zinc in the staging pile area duplicate sample (J1B8V6) are above the acceptance criteria of 30% at 51.7% and 72.4%, respectively. A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. No data required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 600-124 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 600-124 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 C.

REFERENCES

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WCH, 2010a, *IU-2/6 Remaining Sites Sampling and Field Activities*, Logbook EL-1643-02 pp. 75-77, Washington Closure Hanford, Richland, Washington.

WCH, 2010b, *Work Instruction for Verification Sampling of the 600-124, White Bluffs Burn Site and Paint Disposal Area,* Work Instruction No. 0600X-WI-G0032, Rev. 0, Washington Closure Hanford, Richland, Washington.