1217768

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-2 **Control No.:** 2006-032

Waste Site Code(s)/Subsite Code(s): 100-D-14

Reclassification Category: Interim ☒ Final ☐

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

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-14 waste site, part of the 100-DR-2 Operable Unit, was a suspected septic system within the 100-D/DR Area. The 100-D-14 site is located approximately 550 m (1,800 ft) south of the 105-DR Reactor Building, outside of the 100-D perimeter fence. This site was included in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (Remaining Sites ESD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2009) for remove, treat, and dispose (RTD). Remediation of the 100-D-14 waste site was performed from March 28 through March 29, 2012. Verification sampling was conducted at the 100-D-14 waste site on July 17, 2012. Remediation, verification sampling and comparison of residual contaminant concentrations against cleanup levels have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-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). The selected remedy involved (1) excavating the subsite to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the subsite for reclassification as Interim Closed Out.

Basis for reclassification:

Cleanup verification sampling results were evaluated in comparison to the remedial action goals (RAGs). In accordance with this evaluation, the verification sampling results support a reclassification of this subsite to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs established in the Remaining Sites ROD (EPA 1999). The evaluation (which may include fate-and-transport modeling) of all verification sample data collected from the 100-D-14 waste site resulted in a determination that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-14 Unnumbered Septic System (B); Unnumbered Septic Tank #2 Waste Site* (attached). Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

100-DR-2

Attached to: 1217767

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A-6006-136 (REV 0)

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-2 **Control No.:** 2006-032

Waste Site Code(s)/Subsite Code(s): 100-D-14

Regulator comments:

Approval of this WSRF documents regulator agreement that the 100-D-14 waste site qualifies for "Interim Closed Out" under this Interim Action ROD. In addition, Ecology has evaluated the data for this waste site against WAC 173-340 (2007) cleanup levels for direct contact, groundwater protection, and river protection. This evaluation is documented in the letter transmitting Ecology's approval of the waste site's interim reclassification to "Interim Closed Out."

Waste Site Controls:

Engineered Controls: ☐ Yes ☒ No Institutional Controls: ☐ Yes ☒ No O&M Requirements: ☐ Yes ☒ No

If any of the Waste Site Controls are checked Yes, specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents:

J. P. Neath		10/11/12
DOE Federal Project Director (printed)	Signature	Date
N. Menard FOR		10/17/12
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-14, UNNUMBERED SEPTIC SYSTEM (B); UNNUMBERED SEPTIC TANK #2 WASTE SITE

Attachment to Waste Site Reclassification Form 2006-032

October 2012

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-14, UNNUMBERED SEPTIC SYSTEM (B); UNNUMBERED SEPTIC TANK #2 WASTE SITE

EXECUTIVE SUMMARY

The 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 waste site, part of the 100-DR-2 Operable Unit, was a suspected septic system within the 100-D/DR Area. The 100-D-14 site is located approximately 550 m (1,800 ft) south of the 105-DR Reactor Building, outside of the 100-D perimeter fence.

Confirmatory sampling at the 100-D-14 waste site was conducted on January 4, 2006, and July 11, 2007. On January 4, 2006, excavation of a 4-in. vertical concrete pipe, the only feature visible at the surface, showed that the pipe extended approximately 1 m (3 ft) below ground surface to an elbow connected to a generally horizontal concrete pipeline extending to the east. Approximately 6 lateral meters (20 lateral ft) of this pipeline were excavated, and no perforations or other features suggestive of a drain field were discovered. Following this excavation, evidence was discovered that indicated the septic tank location was in a different orientation and farther east than originally assumed for the 100-D-14 waste site. Excavation at the suspect septic tank location on July 11, 2007, revealed the suspect influent vitrified clay pipe (VCP) and suspect effluent VCP belled at one end (consistent with the configuration for connection to a tank). A gap of approximately 5 m (16.4 ft) between the two pipes indicated that the septic tank had been removed.

Based on the confirmatory data evaluation, residual concentrations of nitrate (as nitrogen), DDE, and DDT exceeded the soil remedial action goals (RAGs) for the protection of groundwater and/or the Columbia River. Considering that there are two nitrate groundwater plumes within the 100-D Area (DOE-RL 2011a), the 100-D-14 waste site was perceived as a potential source of nitrate contamination that could contribute to the nitrate groundwater plumes. In consultation with the Washington State Department of Ecology, it was decided, based on the minor nitrate RAG exceedance and the two nitrate groundwater plumes within the 100-D Area, that the 100-D-14 waste site required remedial action. On April 22, 2008, the 100-D-14 waste site was recommended for remediation (WCH 2008) and was included in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision* (EPA 2009).

Remediation of the 100-D-14 waste site was performed from March 28 through March 29, 2012. Approximately 936 bank cubic meters (1,224 bank cubic yards) of excavated materials were removed and stockpiled in a staging pile area west of the excavation prior to disposal at the Environmental Restoration Disposal Facility. No anomalous materials were encountered during the excavation. No overburden material was associated with the waste site.

Verification sampling was conducted at the 100-D-14 waste site on July 17, 2012, per the *Work Instruction for Verification Sampling of the 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 Waste Site* (WCH 2012b). The results indicate that the waste

removal action achieved compliance with the remedial action objectives (RAOs) and RAGs of the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units* (Remaining Sites ROD) (EPA 1999). A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1.

Table ES-1. Summary of Remedial Action Goals for the 100-D-14 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain dose rate of <15 mrem/yr above background for 1,000 years.	Radionuclides were not COPCs for the 100-D-14 waste site.	N/A
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 (7.3×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for hexavalent chromium, the only constituent subject to the cancer risk calculation is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk for hexavalent chromium, the only constituent subject to the cancer risk calculation, is 1.8×10^{-7}, and thus is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	Radionuclides were not COPCs for the 100-D-14 waste site.	N/A
	Attain national primary drinking water standards[a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5[b].		
	Meet total uranium standard of 30 µg/L (21.2 pCi/L)[c].		

Table ES-1. Summary of Remedial Action Goals for the 100-D-14 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of selenium within the site excavation and staging pile area are above the soil RAGs for groundwater and/or river protection. However, RESRAD modeling predicts that selenium will not reach groundwater (and, therefore, the Columbia River) within 1,000 years [d].	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).
[d] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years (based on the distribution coefficient of 5 mL/g for selenium). The vadose zone underlying the soil below the excavation and staging pile area is a minimum of 24.3 m (79.7 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)

The results of the verification sampling are used to make reclassification decisions for the 100-D-14 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011b). In accordance with this evaluation, the verification sampling results support a reclassification of this subsite 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 Remaining Sites ROD (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the 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 2007 *Washington Administrative Code* Chapter 173-340, Table 749-3 were boron, selenium, and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for manganese, selenium and vanadium. Exceeding screening values does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of

manganese and vanadium are below background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site. A table showing contaminant concentrations from the 100-D-14 waste site that exceed ecological screening levels is provided in Appendix A.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-14, UNNUMBERED SEPTIC SYSTEM (B); UNNUMBERED SEPTIC TANK #2 WASTE SITE

STATEMENT OF PROTECTIVENESS

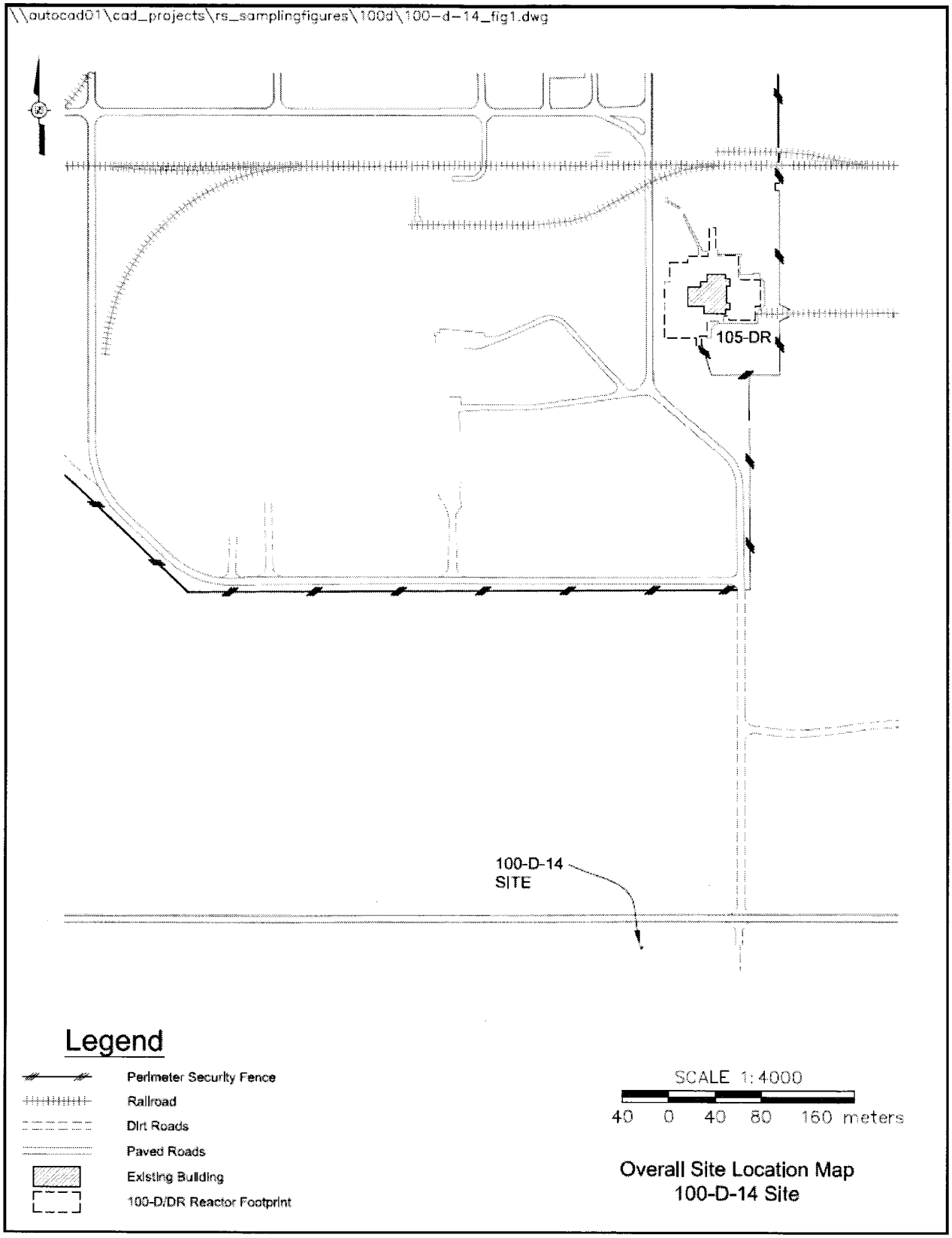
The 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 waste site verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern (COPCs) and other constituents. Those constituents exceeding the ecological screening level in the 2007 *Washington Administrative Code* (WAC) Chapter 173-340, Table 749-3 were boron, selenium, and vanadium. The U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for manganese, selenium and vanadium. Exceeding screening values does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of manganese and vanadium are below background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site. A table showing contaminant concentrations from the 100-D-14 waste site that exceed ecological screening levels is provided in Appendix A.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 waste site, part of the 100-DR-2 Operable Unit, was a suspected septic system within the 100-D/DR Area. The 100-D-14 site is located approximately 550 m (1,800 ft) south of the 105-DR Reactor Building, outside of the 100-D perimeter fence (Figure 1).

Figure 1. Location of the 100-D-14 Waste Site.



The 100-D-14 site was suspected to be a septic system formerly supporting the construction camp badge house before its relocation (WHC 1993). No documentation of any decommissioning activities or nonsanitary releases to the septic system has been located.

Prior to confirmatory sampling, the only feature of the site visible at the surface was a 0.10-m (4-in.) vertical concrete pipe extending slightly above the surrounding ground surface. The pipe was suspected to be a vent line for a septic drain field. A geophysical survey was performed at the 100-D-14 waste site in October 2005 to locate and map surface and subsurface features (WCH 2005b). The geophysical survey was conducted using magnetometer, electromagnetic induction, and ground-penetrating radar; no significant anomalous features were noted by the survey, including possible foreign material or past excavation horizons. The surface inspection identified a soil mound and surface contours, as well as remnants of a (possibly pre-Hanford Site era) wood post and barbed wire fence.

On January 4, 2006, during confirmatory sampling activities (WCH 2005a), the pipe was discovered to extend approximately 1 m (3 ft) below ground surface (bgs) to an elbow connected to a generally horizontal concrete pipeline extending to the east. Approximately 6 lateral m (20 lateral ft) of this pipeline was excavated, and no perforations or other features suggestive of a drain field were discovered.

Following the January 4, 2006, sampling activities, a historical drawing was located that shows a septic system associated with the 100-DR temporary construction camp badge house in the vicinity of the 100-D-14 pipeline, at approximate Washington State Plane coordinates N 150722.0, E 573732.2 (GE 1957). Based on design drawings and site visit observations for the 1607-H3 septic system located in the 100-H Area, it was suspected that the 100-D-14 septic system may have had a design similar to that of the 1607-H3 septic system: a narrow drain field with several long laterals, with vent risers extending from the (western) ends of the laterals opposite the septic tank.

A second geophysical survey was performed at the 100-D-14 site in April 2006 to extend the survey area further east in an attempt to locate a septic tank. The site surface feature map, including the extension to the east, is provided in Figure 2; the interpreted results of the original and extended geophysical surveys are provided in Figure 3. No evidence of a septic tank or drain field was identified in the geophysical data (WCH 2006). A north-south linear with the characteristic of a pipeline was identified near the eastern boundary of the extended survey area, but the position of this linear was consistent with that of a potable water supply line shown on historic drawings. A more suitable east-west linear was also detected. This linear was postulated to be the inlet line terminating at the location shown for the septic tank in the design drawing (GE 1957). A notable geologic horizon was also identified approximately 1.2 m (4 ft) bgs throughout the site. This marker horizon is pervasive throughout the survey area and indicates that potential intrusive activities would not have extended beyond this horizon.

Figure 2. 100-D-14 Site Surface Feature Map.

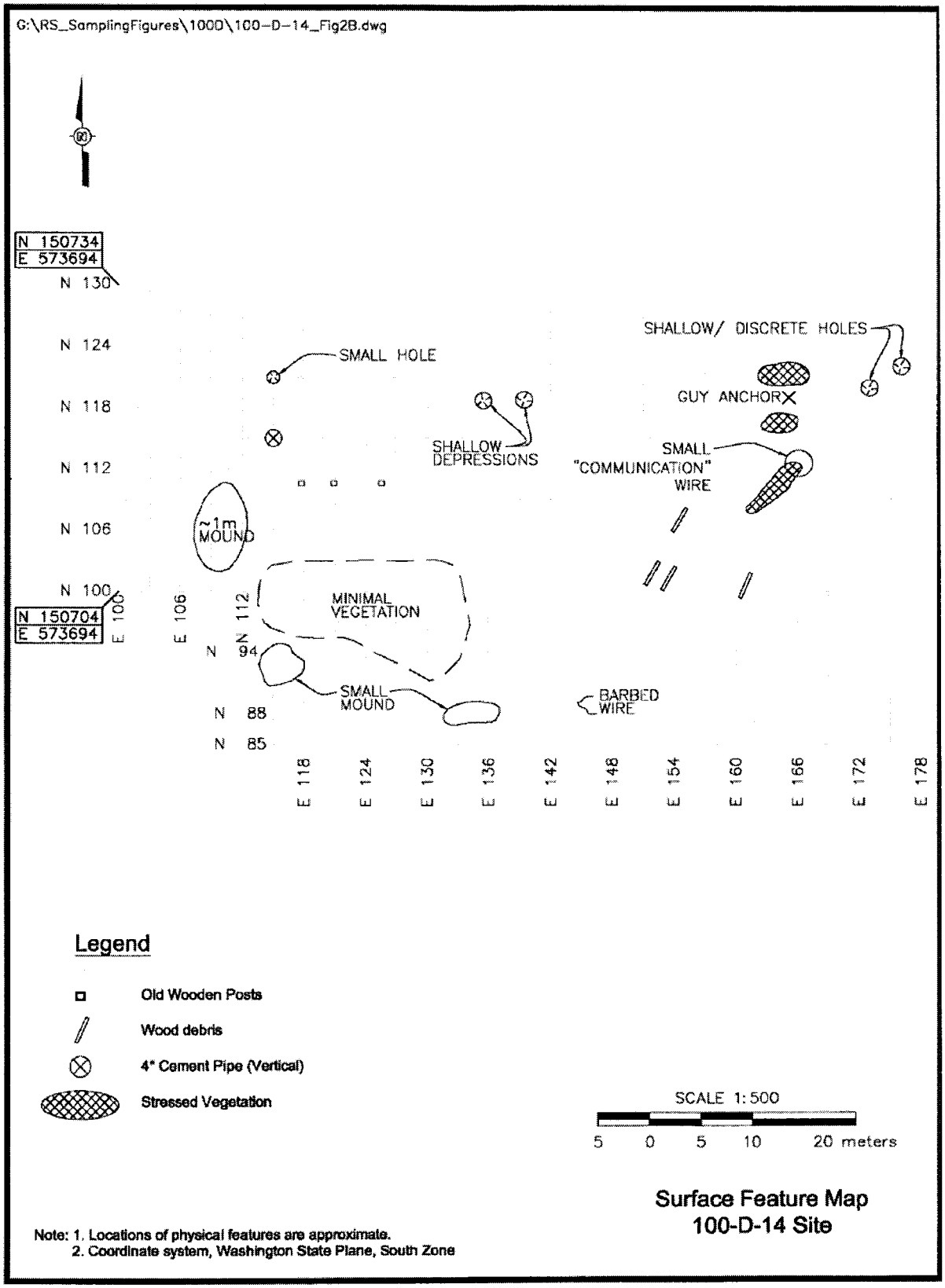
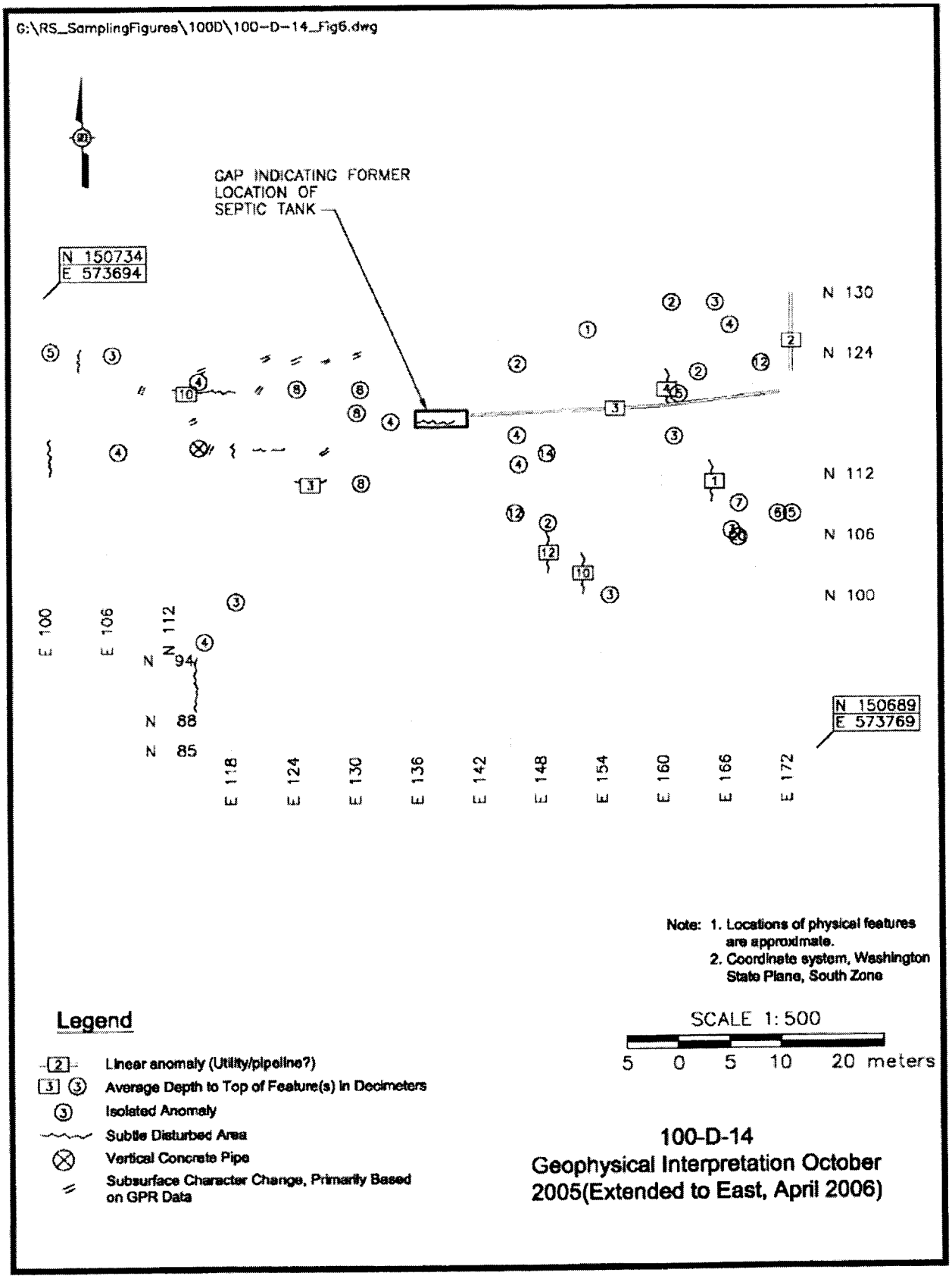


Figure 3. Geophysical Interpretation Map of the 100-D-14 Waste Site.



On July 10, 2007, a shallow pothole was excavated at the suspected septic tank location. A septic tank was not located; however, a 15-cm (6-in.) vitrified clay pipe (VCP) was discovered. The east end of the VCP was observed to be belled, consistent with the configuration for a previous connection to a tank or other feature. The excavation was extended to the west to follow the VCP until it transitioned to a smaller concrete pipe. It was determined that the west end of the pipeline most likely discharged to the drain field. The western VCP segment was 1.5 to 2 m (5 to 6 ft) in length in its entirety, suggesting it was specific to a design rather than a continuation of another pipeline. It was concluded that the VCP segment most likely was the direct effluent line from a former septic tank that has since been removed.

The excavation was extended to the east, and following a gap of approximately 5 m (16.4 ft), the suspect influent VCP was identified. The gap in the pipeline, combined with the old water layout drawing (GE 1957) and the geophysical survey results, suggested that the tank was previously located between the two pipe sections, but has since been removed.

REMEDIATION ACTION SUMMARY

Remediation of the 100-D-14 suspected septic system was performed from March 28 through March 29, 2012. Approximately 936 bank cubic meters (1,224 bank cubic yards) of excavated materials were removed and staged for disposal at the Environmental Restoration Disposal Facility. The lowest depth of the waste site excavation was approximately 4.6 m (15 ft) at the location of the former drain field.

During the 100-D-14 waste site remedial activities, no septic tank was found. Only several segments of pipeline were observed during remediation in addition to an area that resembled a drain field. There is a small 1.5-in. capped pipe that is visible inside the north wall of the excavation. This capped north-south-trending pipeline was determined to be a segment of the 100-D-63 sanitary water supply line.

All excavated materials were stockpiled west of the excavation in the approved staging pile area (Figure 4). No overburden materials were salvaged from the 100-D-14 waste site excavation; therefore, there is no overburden pile associated with the 100-D-14 waste site. The post-remediation topography of the site is shown in Figure 5. Radiological field screening was performed with hand-held instruments during and immediately following remediation. No radiation was detected within the 100-D-14 excavation area.

VERIFICATION SAMPLING ACTIVITIES

This section describes the basis for selection of a verification sampling design for the 100-D-14 waste site. Statistical sampling was the method chosen for selecting the sampling locations. The area identified for the purpose of statistical verification sampling for the 100-D-14 waste site consists of two decision units, the excavated area and the staging pile area.

Figure 4. 100-D-14 Excavation and Staging Pile Area.

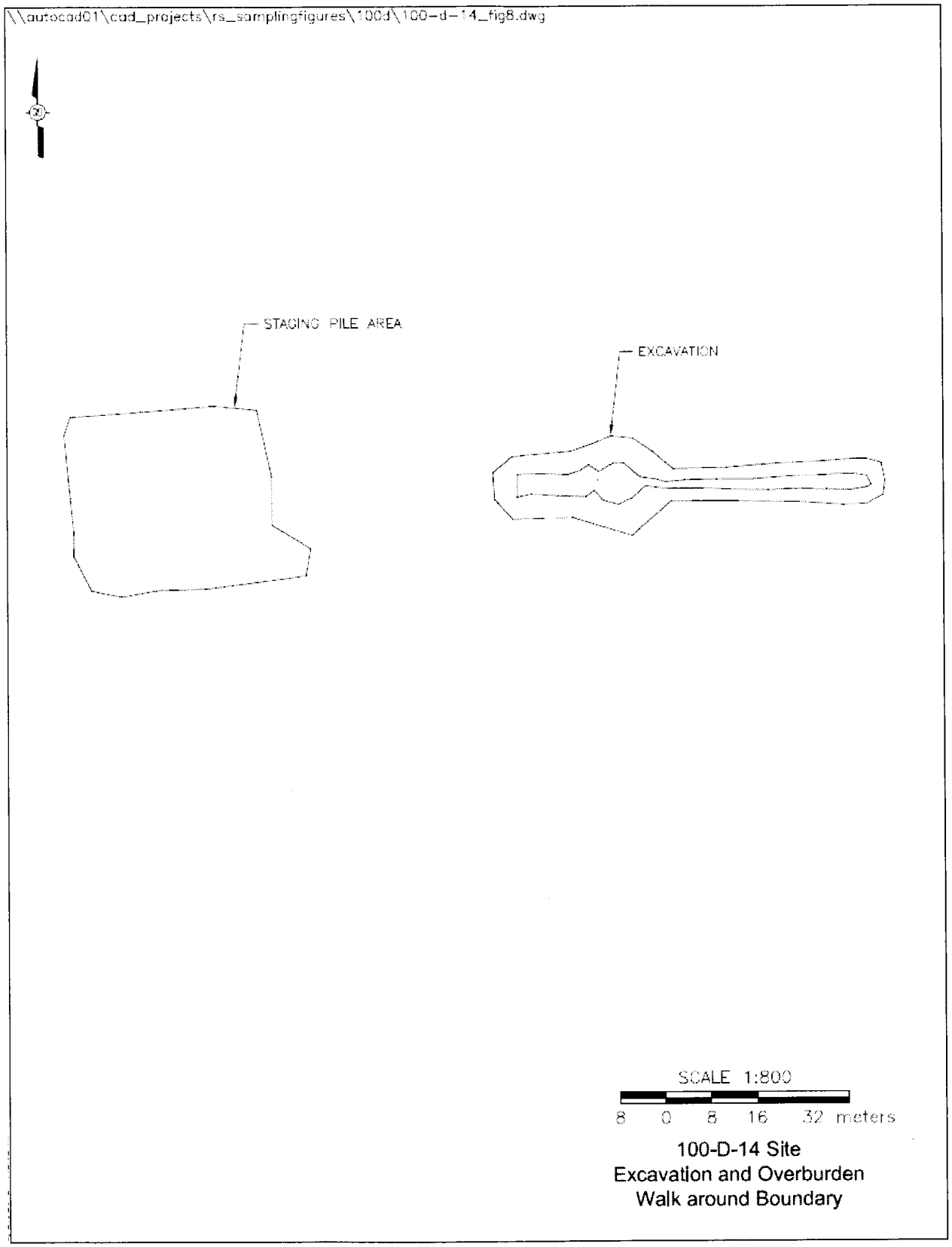
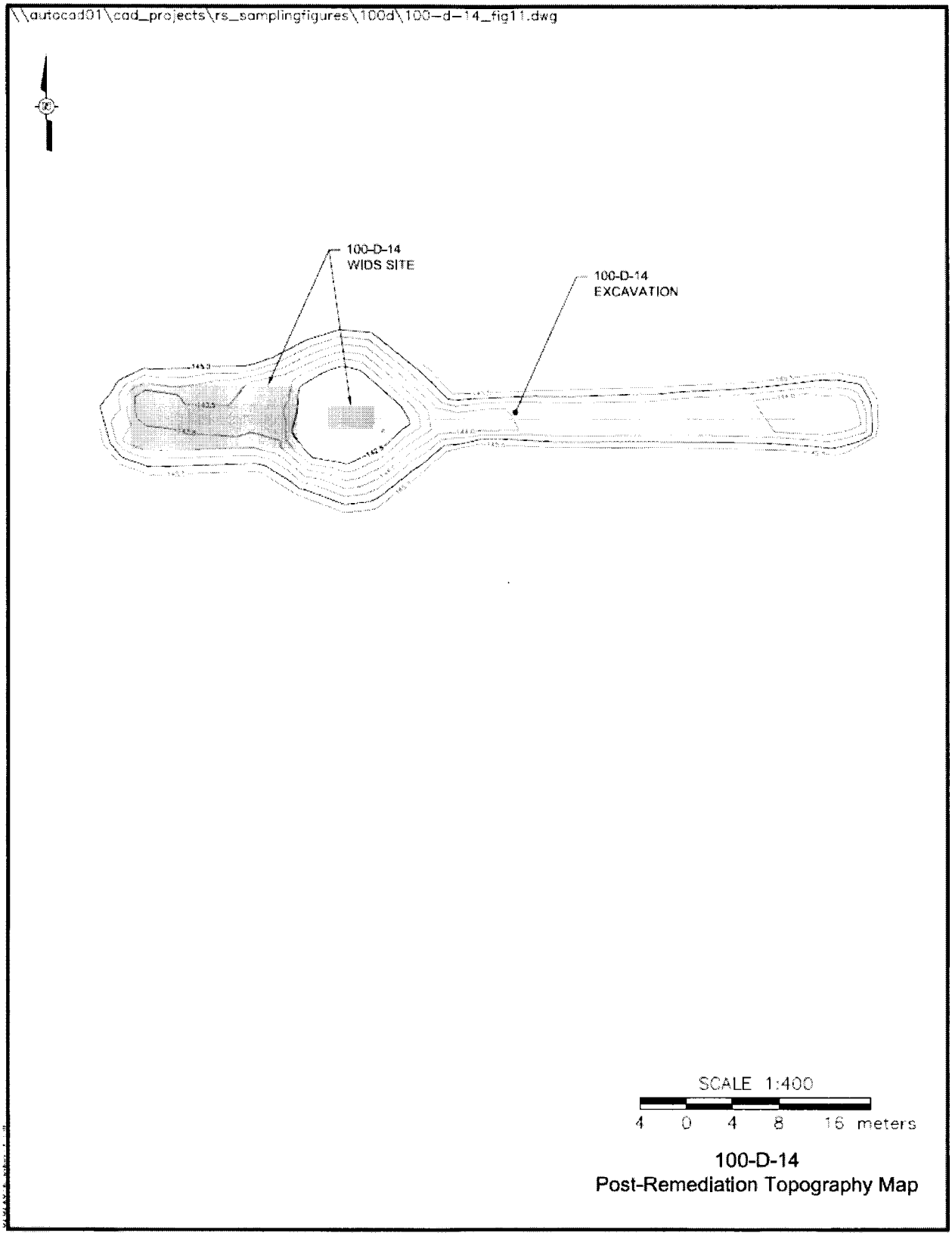


Figure 5. 100-D-14 Post-Remediation Topographic Map.



Verification sampling was conducted at the 100-D-14 waste site on July 17, 2012, to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). Separate statistical sampling designs were used to collect verification soil samples from the 100-D-14 excavated area and the staging pile area. The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the subsite.

Contaminants of Concern for Verification Sampling

The COPCs for the 100-D-14 waste site were identified in consideration of possible site use for sanitary sewage disposal, available confirmatory sampling data, existing historical information, and process knowledge. The COPCs identified in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009a) for other 100-D Area septic systems include lead, pesticides, and semivolatile organic compounds. Based on further evaluation of other septic systems, polychlorinated biphenyls were also included as COPCs for the 100-D-14 waste site. Although not considered COPCs, antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc concentrations were evaluated by performing the expanded inductively coupled plasma (ICP) metals analytical list. Mercury levels were similarly evaluated for the site, although mercury was also not considered a COPC. Due to a site-wide effort to identify the source of hexavalent chromium contamination in the groundwater, hexavalent chromium was added as a COPC. Confirmatory sampling included ion chromatography (IC) anions as COPCs as analytical results before remediation (phase 1) indicated that nitrate was above groundwater and river protection RAGs. All other IC anions were undetected or detected below RAGs in phases 1 and 2 of confirmatory sampling and were not included as COPCs for verification sampling. Ion chromatography (IC) anions were not COPCs for this waste site; however, sample analysis for IC anions was inadvertently requested. Nitrates and nitrites were included as COPCs and were evaluated by appropriate laboratory analytical methods.

Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in confirmatory samples collected at the site, but are not included as COPCs for the 100-D-14 waste site, as these isotopes are unrelated to the operational history of the site and were detected below background levels (based on an assumption of secular equilibrium, the background activities for radium-228 and thorium-228 are equal to the statistical background activity of 1.32 pCi/g for thorium-232 provided in DOE-RL [1996]).

Verification Sampling Design

The statistical sampling design for the 100-D-14 waste was developed using Visual Sample Plan[1] (VSP). The areas identified for the purpose of statistical verification sampling for the 100-D-14 waste site were delineated in VSP and used as the basis for a random-start systematic grid for verification soil sample collection at the site. Twelve statistical discrete soil samples were collected on the grid within each of the two decision units at the 100-D-14 waste site.

[1] Visual Sample Plan is a site map-based user-interface program that may be downloaded at http://vsp.pnnl.gov.

A triangular grid was used based on studies that indicate triangular grids are superior to square grids (Gilbert 1987). Additional details concerning the use of VSP to develop the statistical sampling designs and derive the number of verification samples to collect are discussed in *Work Instruction for Verification Sampling of the 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 Waste Site* (WCH 2012b). The 100-D-14 waste site sample locations are shown in Figures 6 through 9.

Figure 6. 100-D-14 Waste Site Verification Sample Locations.

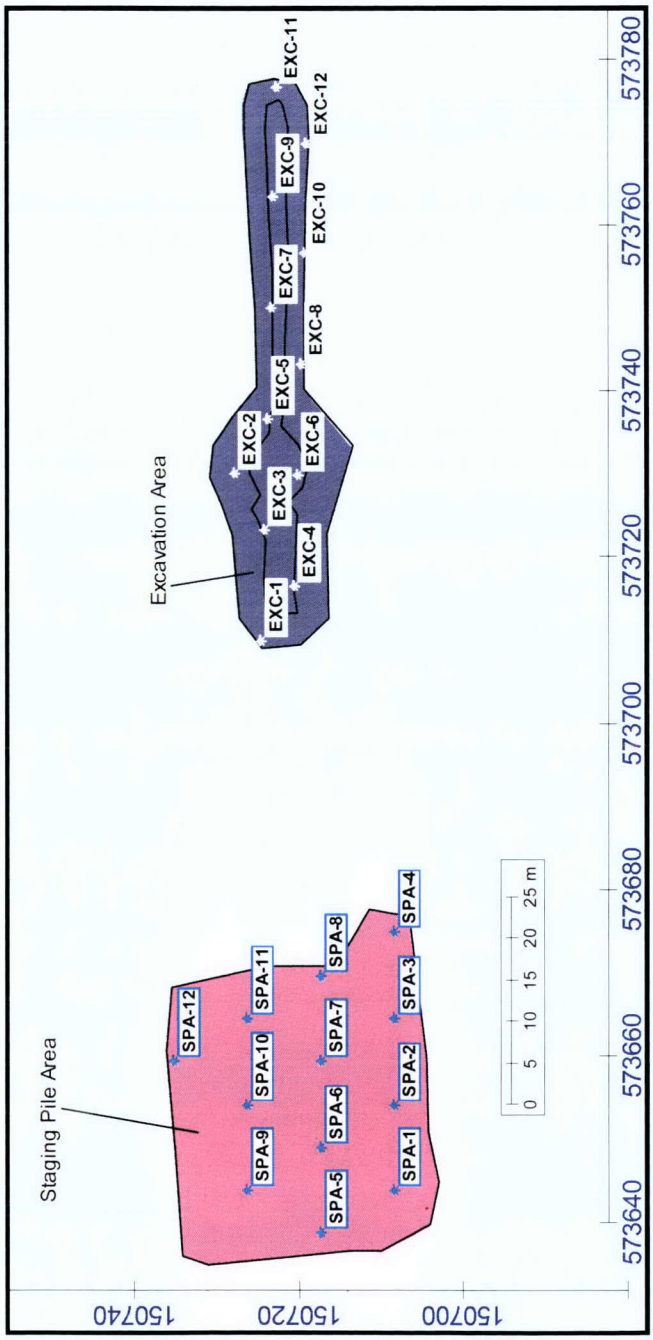


Figure 7. 100-D-14 Excavation Verification Sample Locations.

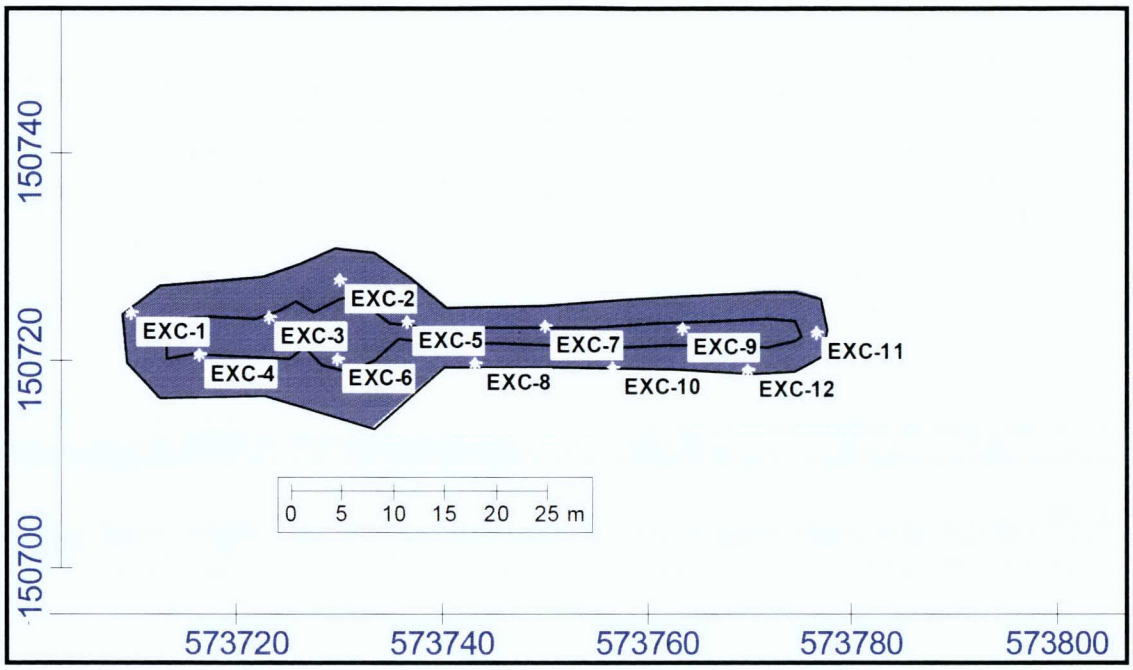


Figure 8. 100-D-14 Staging Pile Area Verification Sample Locations.

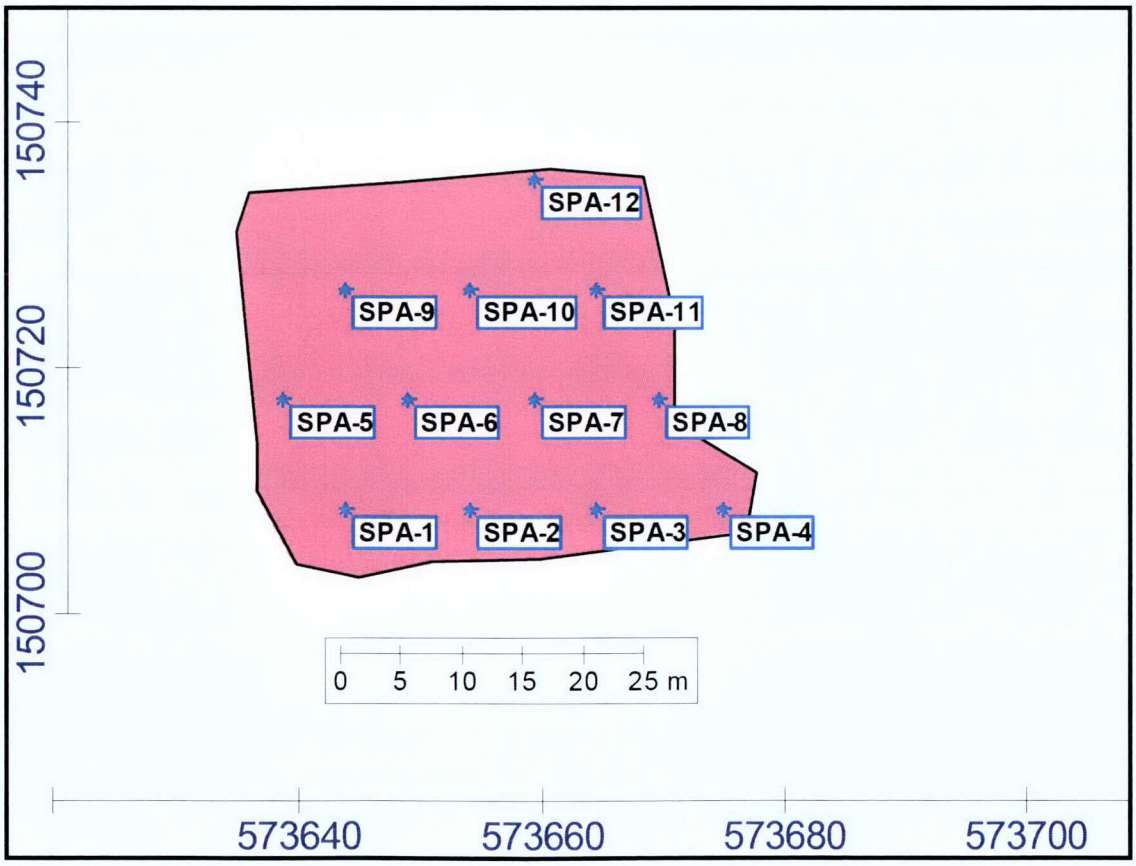
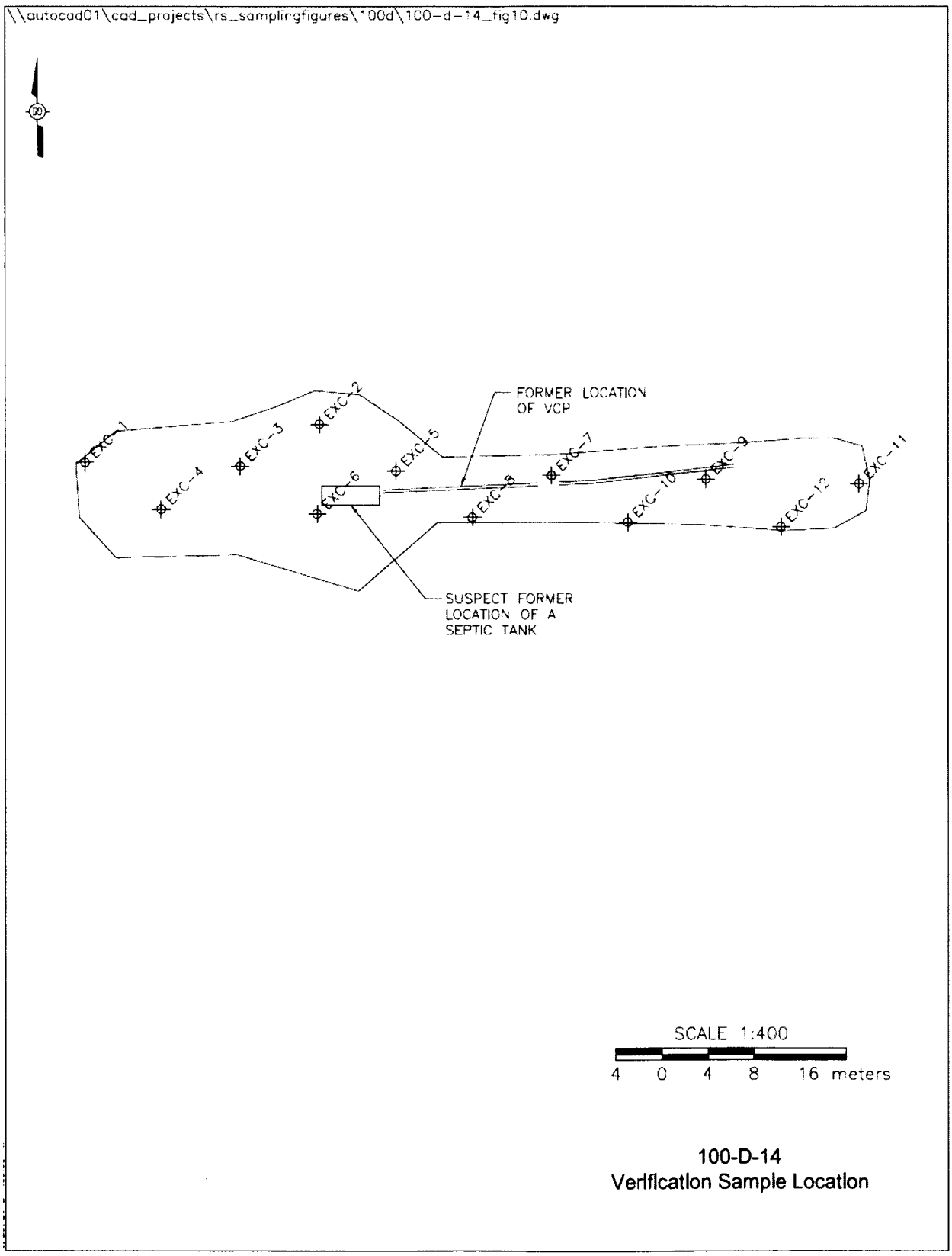


Figure 9. 100-D-14 Map of the Suspected Former Location of a Tank Overlain with Verification Sample Locations.



A summary of the verification samples collected and laboratory analyses performed is provided in Table 1. All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the SAP(DOE-RL 2009a). Table 2 identifies the EPA-approved methods for the analyses performed for verification sampling. Additional information related to verification sampling can be found in the field sampling logbooks (WCH 2012a).

Table 1. 100-D-14 Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
EXC-1	J1PVV9	150724.6	573709.9	ICP metals [a], mercury, hexavalent chromium, pesticides, SVOA, nitrate/nitrite, IC anions [b], PCBs
EXC-2	J1PVW0	150727.9	573730.0	
EXC-3	J1PVW1	150724.3	573723.2	
EXC-4	J1PVW2	150720.6	573716.4	
EXC-5	J1PVW3	150723.9	573736.6	
EXC-6	J1PVW4	150720.2	573729.8	
EXC-7	J1PVW5	150723.5	573749.9	
EXC-8	J1PVW6	150719.9	573743.1	
EXC-9	J1PVW7	150723.2	573763.3	
EXC-10	J1PVW8	150719.5	573756.5	
EXC-11	J1PVW9	150722.8	573776.6	
EXC-12	J1PVX0	150719.1	573769.8	
Duplicate of J1PVW5	J1PVX1	150723.5	573749.9	
SPA-1	J1PVX2	150708.6	573643.9	ICP metals [a], mercury, hexavalent chromium, pesticides, SVOA, nitrate/nitrite, IC anions [b], PCBs
SPA-2	J1PVX3	150708.6	573654.2	
SPA-3	J1PVX4	150708.6	573664.5	
SPA-4	J1PVX5	150708.6	573674.8	
SPA-5	J1PVX6	150717.5	573638.7	
SPA-6	J1PVX7	150717.5	573649.0	
SPA-7	J1PVX8	150717.5	573659.3	
SPA-8	J1PVX9	150717.5	573669.6	
SPA-9	J1PW00	150726.4	573643.9	
SPA-10	J1PW01	150726.4	573654.2	
SPA-11	J1PW02	150726.4	573664.5	
SPA-12	J1PW03	150735.3	573659.3	
Duplicate of J1PVX7	J1PW04	150717.5	573649.0	

Table 1. 100-D-14 Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
Equipment blank	J1PW05	NA	NA	ICP metals [a], mercury and SVOA

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

[b] Analyses were mistakenly ordered and performed for the extended list of IC anions including bromide, chloride, fluoride, nitrate, nitrite, and phosphate. IC anions are not contaminants of potential concern for the 100-D-96 waste site.

HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
PCB = polychlorinated biphenyls
SVOA = semivolatile organic analysis
TBD = to be determined

Table 2. 100-D-14 Laboratory Analytical Methods and Contaminants of Potential Concern.

Analysis	Analytical Method	Contaminant of Potential Concern
ICP metals [a]	EPA Method 6010	Lead
Mercury	EPA Method 7471	Mercury
IC anions	EPA Method 9056	NA [b]
Hexavalent chromium	EPA Method 7196	Hexavalent chromium
Pesticides	EPA Method 8081	Pesticides
SVOA	EPA Method 8270	Semivolatile organic compounds
Nitrate/nitrite	EPA Method 353.2	Nitrate
PCBs	EPA Method 8082	Polychlorinated biphenyls

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

[b] Analyses were mistakenly ordered and performed for the extended list of IC anions including bromide, chloride, fluoride, nitrate, nitrite, and phosphate. IC anions are not contaminants of potential concern for the 100-D-96 waste site.

EPA = U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Verification Sampling Results

All verification samples were analyzed using analytical methods approved by EPA (DOE-RL 2009b). Evaluation of the verification data from the 100-D-14 waste site was performed by direct comparison of the statistical or maximum sample results for each COPC against cleanup criteria.

The primary statistical calculation to evaluate compliance with cleanup standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each detected COPC are computed for each of the 100-D-14 decision units as specified by the RDR/RAWP (DOE-RL 2009b). The calculations are provided in Appendix B. When a

nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for a decision unit, the maximum detected value was used for comparison to RAGs. If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC.

Comparisons of the results for site COPCs with the RAGs for each of the 100-D-14 decision units are listed in Tables 3 and 4. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2012) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A)* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in these tables. The complete laboratory results are stored in the Environmental Restoration (ENRE) project-specific database prior to submitting to the Hanford Environmental Information System (HEIS) for archiving and are provided in Appendix B.

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-14 Excavation Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.9 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	72.1 (<BG)	5,600	200	400	No	--
Beryllium	0.25 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.4	7,200	320	-- [f]	No	--
Cadmium	0.12 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	13.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	6.9 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	17.1 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.380	2.1	4.8	2	No	--
Lead	4.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	316 (<BG)	3,760	512 [c]	-- [f]	No	--
Mercury	0.0068 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.28	400	8	-- [f]	No	--
Nickel	12.8 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	1.4	400	5	1	Yes	Yes [g]
Silver	0.18 (<BG)	400	8	0.73 [c]	No	--
Vanadium	47.0 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	38.1 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	16.0 (<BG)	--	25,000	-- [f]	No	--
Fluoride	1.3 (<BG)	4,800	96	400	No	--
Nitrogen in nitrate	2.2 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrite [e]	0.46	8,000	100	200	No	--

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-14 Excavation Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Nitrogen in nitrite and nitrate	2.7 (<BG)	128,000	1,000	2,000	No	--
Sulfate	71.9 (<BG)	--	25,000	-- [f]	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% UCL, depending on data censorship, as described in the *100-D-14 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level 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 (WAC 173-340-750[3]) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).
[g] Based on the RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years (based on the distribution coefficient of 5 mL/g). The vadose zone underlying the soil below the excavation and staging pile area is a minimum of 24.3 m (79.7 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 100-D-14 Staging Pile Area Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.4 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	71.6 (<BG)	5,600	200	400	No	--
Beryllium	0.24 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.6	7,200	320	-- [f]	No	--
Cadmium	0.10 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	12.9 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.2 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.0 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	4.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	331 (<BG)	3,760	512 [c]	-- [f]	No	--
Nickel	12.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	1.9	400	5	1	Yes	Yes [g]
Silver	0.17 (<BG)	400	8	0.73 [c]	No	--
Vanadium	48.9 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	39.1 (<BG)	24,000	480	67.8 [c]	No	--

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 100-D-14 Staging Pile Area Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Chloride	6.8 (<BG)	--	25,000	-- [f]	No	--
Fluoride	0.91 (<BG)	4,800	96	400	No	--
Nitrogen in nitrate	3.0 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrite [e]	0.50	8,000	100	200	No	--
Nitrogen in nitrite and nitrate	4.9 (<BG)	128,000	1,000	2,000	No	--
Sulfate	33.5 (<BG)	--	25,000	-- [f]	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% UCL, depending on data censorship, as described in the *100-D-14 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level 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 (WAC 173-340-750[3]) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).
[g] Based on the RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years (based on the distribution coefficient of 5 mL/g). The vadose zone underlying the soil below the excavation and staging pile area is a minimum of 24.3 m (79.7 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

DATA EVALUATION

This section demonstrates that remedial actions at the 100-D-14 waste site have achieved the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the RDR/RAWP (DOE-RL 2009b).

Attainment of Nonradionuclide RAGs

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values with the exception of selenium in comparison against the soil RAGs for groundwater and/or river protection in the site excavation and staging pile area decision units. However, given the soil-partitioning coefficient for selenium of 5 mL/g, it would not be expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b). The vadose zone thickness beneath the excavation is approximately 24.3 m (79.7 ft). Therefore, residual concentrations of selenium are predicted to be protective of groundwater (and thus the Columbia River).

Three-Part Test for Nonradionuclides

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

The application of the three-part test for the 100-D-14 waste site is included in the statistical calculations, where half or more of the data set analyses were detected (Appendix B). The results of this evaluation indicate that all residual COPC concentrations pass the three-part test in comparison against applicable RAGs.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set analyses were detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs, with the exception of selenium. The residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years (based on the distribution coefficient [K_d] of 5 mL/g for selenium). With approximately 24.3 m (79.7 ft) of vadose zone below the excavation and 27.3 m (89.6 ft) of vadose zone below the staging pile area, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 100-D-14 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. 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 7.3×10^{-3}. The carcinogenic risk value for hexavalent chromium, the only carcinogenic constituent detected above background levels, is 1.8×10^{-7}, which is below the individual and cumulative cancer risk standards of 1×10^{-6}, and 1×10^{-5}, respectively. Therefore, the 100-D-14 waste site meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-14 waste site included calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. These risk values were conservatively calculated for the entire waste site using the highest value for each COPC from each of the decision units. Risk values were calculated for constituents that were detected at concentrations above Hanford Site

or Washington State background values or for which there is no background value. In addition, the K_d values for these contaminants are less than that necessary to show no migration to groundwater in 1,000 years based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b). Based on this model and a vadose zone of approximately 24.3 m (79.7 ft) in thickness at the excavation, a K_d of 3.1 or greater is required to show no predicted migration to groundwater within 1,000 years. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-D-14 waste site is 8.7×10^{-2}, which is less than 1.0. The 100-D-14 waste site does not have any carcinogenic constituents subject to the groundwater cancer risk calculation; therefore, the criterion for excess cancer risk is met. Nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach, the field logbook (WCH 2012a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA for the 100-D-14 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 its archival in the HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-D-14 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 subsite meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-14 waste site to Interim Closed Out. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

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APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Contaminants Exceeding Ecological Screening Levels for the 100-D-14 Waste Site [a].

Hazardous Substance		2007 WAC 173-340, Table 749-3			EPA Ecological Soil Screening Levels [b]				Waste Site Analyses
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
Metals (mg/kg):									
	Background								
Boron [d]	--	0.5							1.6
Manganese	512	1,100 [e]		1,500	220	450	4,300	4,000	331 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	1.9
Vanadium	85.1	2					7.8	280	48.9 (<BG)

NOTE: Shaded cells are exceeded by the maximum or the statistical result.
Blank cells = Values not available.

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

[b] Available on the Internet at www.epa.gov/ecotox/ecossl.

[c] Wildlife.

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

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

BG = background
EPA = U.S. Environmental Protection Agency
WAC = *Washington Administrative Code*

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATION BRIEFS

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

100-D-14 Waste Site Cleanup Verification 95% UCL Calculations, 0100D-CA-V0464, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-14 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0465, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-14 Waste Site Protection of Groundwater Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0467, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

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

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CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0464

Subject: 100-D-14 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 =19 Attm. 1 = 18 Total = 38	N. K. Schiffern N K Schiffern	I. B. Berezovskiy IB Berezovskiy	J. D. Skoglie J D Skoglie	D. F. Obenauer D. F. Obenauer	10/22/12

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	N. K. Schiffern	**Date**	08/08/12	**Calc. No.** 0100D-CA-V0464	**Rev. No.** 0
Project	100-D Field Remediation	**Job No.**	14655	**Checked** I. B. Berezovskiy	**Date** 08/08/12
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				**Sheet No.** 1 of 19

Summary

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

Table of Contents:
Sheets 1 to 4 - Calculation Sheet Summary
Sheets 5 to 12 - Calculation Sheet Verification Data - Excavation and Staging Pile Area
Sheets 13 to 17 - Ecology Software (MTCAStat) Results
Sheets 18 to 19 - Calculation Sheet - Duplicate Analysis
Attachment 1 - 100-D-14 waste site, Verification Sampling Results (18 pages)

Given/References:
1) Sample Results (Attachment 1).
2) DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
5) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets),* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
6) Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
7) EPA, 1989, *Risk Assessment Guidance for Superfund:* Volume 1, *Human Health Evaluation Manual, Part A; Interim Final,* EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D. C.
8) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code.*

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

Calculation Description:
The subject calculations were performed on statistical data from soil verification samples (Attachment 1) from the 100-D-14 waste site. The data were entered into an EXCEL 2003 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2009b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
The 100-D-14 waste site underwent statistical sampling. The 100-D-14 waste site has two decision units for verification sampling, consisting of excavation and staging pile area.

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Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				**Sheet No.** 2 of 19	

Summary (continued)

Methodology, continued:

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

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

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

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

The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDLs are pre-determined values for analytical methods and constituents with cleanup levels as listed in Table 2-1 of the SAP (DOE-RL 2009a). Table 2-1 includes nominal TDLs for identified methods based organic analyses. The nominal TDLs are also used in support of the RPD calculation for the methods based analytes. TDLs not included in Table 2-1 are based on the laboratory and/or methods used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator	N. K. Schiffern	**Date**	08/07/12	**Calc. No.** 0100D-CA-V0464	**Rev. No.** 0
Project	100-D Field Remediation	**Job No.**	14655	**Checked** I. B. Berezovskiy	**Date** 08/07/12
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				**Sheet No.** 3 of 19

Summary (continued)

QUALIFIER LIST

B = estimate
C = Sample was </= 5X the blank concentration
J = estimate
M = sample duplicate precision not met
N = recovery is outside control limits
U = undetected
X = > 40% difference between primary and confirmation detector results.

ACRONYM LIST

– = not applicable
DE = direct exposure
EX = excavation
GW = groundwater
MTCA = *Model Toxics Control Act*
NA = not applicable
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
SVOA = semivolatile organic analysis
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford **CALCULATION SHEET**

Originator	N. K. Schiffern	**Date**	08/16/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

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

Results Summary - Excavation [a]

Analyte	95% UCL Result	Maximum Result	Units
Arsenic	3.9	--	mg/kg
Barium	72.1	--	mg/kg
Beryllium	0.25	--	mg/kg
Boron	1.4	--	mg/kg
Cadmium	0.12	--	mg/kg
Chromium	13.6	--	mg/kg
Cobalt	6.9	--	mg/kg
Copper	17.1	--	mg/kg
Hexavalent chromium	--	0.380	mg/kg
Lead	4.3	--	mg/kg
Manganese	316	--	mg/kg
Mercury	--	0.0068	mg/kg
Molybdenum	--	0.28	mg/kg
Nickel	12.8	--	mg/kg
Selenium	--	1.4	mg/kg
Silver	--	0.18	mg/kg
Vanadium	47.0	--	mg/kg
Zinc	38.1	--	mg/kg
Chloride	16.0	--	mg/kg
Fluoride	1.3	--	mg/kg
Nitrogen in Nitrate	2.2	--	mg/kg
Nitrogen in Nitrite	0.46	--	mg/kg
Nitrogen in Nitrite and Nitrate	2.7	--	mg/kg
Sulfate	71.9	--	mg/kg

3-Part Test Evaluation

95% UCL or Maximum > Cleanup Limit?	NO	YES
> 10% above Cleanup Limit?	NO	YES
Any sample > 2x Cleanup Limit?	NO	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	3.4	--	mg/kg
Barium	71.6	--	mg/kg
Beryllium	0.24	--	mg/kg
Boron	1.6	--	mg/kg
Cadmium	0.10	--	mg/kg
Chromium	12.9	--	mg/kg
Cobalt	7.2	--	mg/kg
Copper	14.0	--	mg/kg
Lead	4.3	--	mg/kg
Manganese	331	--	mg/kg
Nickel	12.2	--	mg/kg
Selenium	--	1.9	mg/kg
Silver	--	0.17	mg/kg
Vanadium	48.9	--	mg/kg
Zinc	39.1	--	mg/kg
Chloride	6.8	--	mg/kg
Fluoride	--	0.91	mg/kg
Nitrogen in Nitrate	3.0	--	mg/kg
Nitrogen in Nitrite	0.50	--	mg/kg
Nitrogen in Nitrite and Nitrate	4.9	--	mg/kg
Sulfate	33.5	--	mg/kg

3-Part Test Evaluation

95% UCL or Maximum > Cleanup Limit?	NO	YES
> 10% above Cleanup Limit?	NO	YES
Any sample > 2x Cleanup Limit?	NO	NO

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

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

Analyte	Duplicate Analysis	
	Excavation	Staging Pile Area
Aluminum	0.1%	1.1%
Barium	5.9%	4.0%
Calcium	1.3%	3.5%
Chromium	3.8%	6.3%
Copper	2.6%	1.5%
Iron	3.8%	0.5%
Magnesium	0.4%	0.9%
Manganese	1.4%	
Silicon	18.1%	21.3%
Vanadium	3.5%	4.8%
Zinc	2.2%	0.5%
Sulfate		20.5%

Grey cells indicate not applicable

[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.

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Washington Closure Hanford

Originator N. K. Schiffern NS	Date 08/08/12	Calc. No. 0100D-CA-V0464	Rev. No. 0
Project 100-D Field Remediation	Job No. 14655	Checked I. B. Berezovskiy	Date 08/08/12
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations			Sheet No. 5 of 19

100-D-14 Waste Site Statistical Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	4.2		0.67	64.4		0.078	0.21		0.034	1.0	B	1.0	0.10	B	0.042	13.0		0.059	6.0	X	0.10	15.2		0.22
Duplicate of J1PVW5	J1PVX1	7/17/2012	3.9		0.62	60.7		0.071	0.20		0.031	0.91	U	0.91	0.12	B	0.038	13.5		0.054	5.9	X	0.093	15.6		0.20
EXC-1	J1PVV9	7/17/2012	3.3		0.66	68.5		0.076	0.23		0.033	1.5	B	1.0	0.11	B	0.041	12.1		0.058	6.6	X	0.10	16.6		0.22
EXC-2	J1PVW0	7/17/2012	4.3		0.67	67.0		0.077	0.22		0.034	1.0	U	1.0	0.14	B	0.042	14.7		0.059	6.4	X	0.10	15.7		0.22
EXC-3	J1PVW1	7/17/2012	3.3		0.64	64.8		0.074	0.20		0.032	1.3	B	1.0	0.11	B	0.040	10.9		0.056	6.5	X	0.10	15.5		0.21
EXC-4	J1PVW2	7/17/2012	3.6		0.62	74.6		0.071	0.22		0.031	1.1	B	0.92	0.10	B	0.038	11.9		0.054	6.4	X	0.094	15.7		0.20
EXC-5	J1PVW3	7/17/2012	4.4		0.68	69.7		0.078	0.25		0.034	1.2	B	1.0	0.16	B	0.042	16.0		0.060	7.0	X	0.10	20.5		0.22
EXC-6	J1PVW4	7/17/2012	3.7		0.61	58.3		0.070	0.19		0.030	1.0	B	0.90	0.090	B	0.038	11.4		0.053	6.5	X	0.092	14.0		0.20
EXC-8	J1PVW6	7/17/2012	3.7		0.63	80.4		0.072	0.28		0.031	1.2	B	0.93	0.10	B	0.039	13.2		0.055	7.4	X	0.10	17.3		0.21
EXC-9	J1PVW7	7/17/2012	3.8		0.63	75.0		0.072	0.25		0.031	0.94	B	0.93	0.092	B	0.039	13.0		0.055	6.6	X	0.10	17.2		0.21
EXC-10	J1PVW8	7/17/2012	3.0		0.63	67.8		0.072	0.24		0.031	1.0	B	0.93	0.10	B	0.039	11.9		0.055	6.8	X	0.10	14.5		0.21
EXC-11	J1PVW9	7/17/2012	3.1		0.64	69.7		0.074	0.24		0.032	1.1	B	1.0	0.089	B	0.040	12.8		0.057	6.9	X	0.10	16.5		0.21
EXC-12	J1PVX0	7/17/2012	3.6		0.65	68.3		0.074	0.26		0.032	1.9	B	1.0	0.11	B	0.040	13.1		0.057	6.9	X	0.10	16.2		0.21

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
EXC-7	J1PVW5/J1PVX1	7/17/2012	4.1	62.6	0.21	0.73	0.11	13.3	6.0	15.4
EXC-1	J1PVV9	7/17/2012	3.3	68.5	0.23	1.5	0.11	12.1	6.6	16.6
EXC-2	J1PVW0	7/17/2012	4.3	67.0	0.22	0.50	0.14	14.7	6.4	15.7
EXC-3	J1PVW1	7/17/2012	3.3	64.8	0.20	1.3	0.11	10.9	6.5	15.5
EXC-4	J1PVW2	7/17/2012	3.6	74.6	0.22	1.1	0.10	11.9	6.4	15.7
EXC-5	J1PVW3	7/17/2012	4.4	69.7	0.25	1.2	0.16	16.0	7.0	20.5
EXC-6	J1PVW4	7/17/2012	3.7	58.3	0.19	0.95	0.090	11.4	6.5	14.0
EXC-8	J1PVW6	7/17/2012	3.7	80.4	0.28	1.2	0.10	13.2	7.4	17.3
EXC-9	J1PVW7	7/17/2012	3.8	75.0	0.25	0.94	0.092	13.0	6.6	17.2
EXC-10	J1PVW8	7/17/2012	3.0	67.8	0.24	1.0	0.10	11.9	6.8	14.5
EXC-11	J1PVW9	7/17/2012	3.1	69.7	0.24	1.1	0.089	12.8	6.9	16.5
EXC-12	J1PVX0	7/17/2012	3.6	68.3	0.26	1.9	0.11	13.1	6.9	16.2

Statistical Computations

	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
N	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	8%	0%	0%	0%	0%
Mean	3.7	68.9	0.23	1.1	0.11	12.9	6.7	16.3
Standard deviation	0.44	5.9	0.026	0.36	0.021	1.41	0.37	1.7
95% UCL on mean	3.9	72.1	0.25	1.4	0.12	13.6	6.9	17.1
Maximum value	4.4	80.4	0.28	1.9	0.16	16.0	7.4	20.5
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern **Date** 08/08/12 **Calc. No.** 0100D-CA-V0464 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 08/08/12
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1 **100-D-14 Waste Site Statistical Calculations**
2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Lead			Manganese			Nickel			Vanadium			Zinc			Chloride			Fluoride			Nitrogen in Nitrate		
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	EXC-7	J1PVW5	7/17/2012	3.6		0.28	279		0.10	12.7	X	0.13	40.6		0.096	32.9		0.41	2.0	U	2.0	1.8	B	0.81	0.64	BJ	0.31
6	Duplicate of J1PVW5	J1PVX1	7/17/2012	3.5		0.25	283		0.093	12.4	X	0.11	39.2		0.088	32.2		0.37	2.0	U	2.0	2.0	B	0.84	0.66	BJ	0.32
7	EXC-1	J1PVV9	7/17/2012	4.2		0.27	318		0.099	11.6	X	0.12	48.3		0.094	39.7		0.40	4.3	B	2.0	0.82	UN	0.82	3.5	J	0.31
8	EXC-2	J1PVW0	7/17/2012	3.8		0.28	299		0.10	13.2	X	0.13	40.5		0.096	35.8		0.41	62.3		2.0	1.4	B	0.83	2.4	BJ	0.32
9	EXC-3	J1PVW1	7/17/2012	4.2		0.26	303		0.097	11.0	X	0.12	48.2		0.092	39.3		0.39	3.0	B	1.9	1.3	B	0.79	2.6	J	0.30
10	EXC-4	J1PVW2	7/17/2012	3.7		0.25	296		0.094	11.4	X	0.12	41.1		0.088	34.3		0.37	2.4	B	2.0	1.9	B	0.84	1.2	BJ	0.32
11	EXC-5	J1PVW3	7/17/2012	4.9		0.28	326		0.10	13.6	X	0.13	46.9		0.097	38.5		0.41	6.9		2.0	1.8	B	0.85	1.1	BJ	0.32
12	EXC-6	J1PVW4	7/17/2012	3.7		0.25	297		0.092	10.9	X	0.11	49.9		0.087	35.6		0.37	5.0		1.8	1.1	B	0.77	1.8	BJ	0.29
13	EXC-8	J1PVW6	7/17/2012	4.6		0.26	336		0.095	13.6	X	0.12	47.8		0.089	39.0		0.38	2.0	B	1.9	0.80	U	0.80	1.1	BJ	0.31
14	EXC-9	J1PVW7	7/17/2012	3.9		0.26	301		0.095	12.5	X	0.12	44.2		0.089	35.9		0.38	1.9	B	1.9	1.1	B	0.81	1.0	BJ	0.31
15	EXC-10	J1PVW8	7/17/2012	3.9		0.26	314		0.095	12.6	X	0.12	45.8		0.089	36.5		0.38	2.2	B	1.9	0.78	U	0.78	1.2	BJ	0.30
16	EXC-11	J1PVW9	7/17/2012	4.1		0.26	321		0.098	11.8	X	0.12	45.3		0.092	38.5		0.39	1.9	U	1.9	0.78	U	0.78	1.3	BJ	0.30
17	EXC-12	J1PVX0	7/17/2012	4.4		0.26	307		0.098	12.4	X	0.12	44.3		0.092	36.6		0.39	1.9	B	1.9	0.81	U	0.81	1.4	BJ	0.31

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Lead	Manganese	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	EXC-7	J1PVW5/J1PVX1	7/17/2012	3.6	281	12.6	39.9	32.6	1.0	1.9	0.65
22	EXC-1	J1PVV9	7/17/2012	4.2	318	11.6	48.3	39.7	4.3	0.41	3.5
23	EXC-2	J1PVW0	7/17/2012	3.8	299	13.2	40.5	35.8	62.3	1.4	2.4
24	EXC-3	J1PVW1	7/17/2012	4.2	303	11.0	48.2	39.3	3.0	1.3	2.6
25	EXC-4	J1PVW2	7/17/2012	3.7	296	11.4	41.1	34.3	2.4	1.9	1.2
26	EXC-5	J1PVW3	7/17/2012	4.9	326	13.6	46.9	38.5	6.9	1.8	1.1
27	EXC-6	J1PVW4	7/17/2012	3.7	297	10.9	49.9	35.6	5.0	1.1	1.8
28	EXC-8	J1PVW6	7/17/2012	4.6	336	13.6	47.8	39.0	2.0	0.40	1.1
29	EXC-9	J1PVW7	7/17/2012	3.9	301	12.5	44.2	35.9	1.9	1.1	1.0
30	EXC-10	J1PVW8	7/17/2012	3.9	314	12.6	45.8	36.5	2.2	0.39	1.2
31	EXC-11	J1PVW9	7/17/2012	4.1	321	11.8	45.3	38.5	1.0	0.39	1.3
32	EXC-12	J1PVX0	7/17/2012	4.4	307	12.4	44.3	36.6	1.9	0.41	1.4

33 **Statistical Computations**

34		Lead	Manganese	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate
35	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), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	17%	42%	0%
38	Mean	4.1	308	12.3	45.2	36.9	7.8	1.0	1.6
39	Standard deviation	0.40	15.3	0.93	3.3	2.2	17.2	0.63	0.83
40	95% UCL on mean	4.3	316	12.8	47.0	38.1	16.0	1.3	2.2
41	Maximum value	4.9	336	13.6	49.9	39.7	62.3	2.0	3.5
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	10.2 GW & River Protection	512 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	96 GW Protection	1000 GW Protection
43	**WAC 173-340 3-PART TEST**								
44	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA
47	**WAC 173-340 Compliance?**	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/08/12
Job No. 14655

Calc. No. 0100D-CA-V0464
Checked I. B. Berezovskiy

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100-D-14 Waste Site Statistical Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Nitrogen in Nitrite mg/kg	Q	PQL	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	0.38	BJ	0.33	0.31	U	0.31	3.7	BCU	1.7
Duplicate of J1PVW5	J1PVX1	7/17/2012	0.39	BJ	0.34	0.31	U	0.31	3.7	BCU	1.8
EXC-1	J1PVV9	7/17/2012	0.64	BJ	0.33	3.8		0.30	6.5	CU	1.7
EXC-2	J1PVW0	7/17/2012	0.34	UJ	0.34	1.8		0.30	42.0		1.7
EXC-3	J1PVW1	7/17/2012	0.60	BJ	0.32	2.8		0.30	45.5		1.7
EXC-4	J1PVW2	7/17/2012	0.43	BJ	0.34	0.79		0.30	14.1		1.8
EXC-5	J1PVW3	7/17/2012	0.40	BJ	0.35	0.50	B	0.31	93.5		1.8
EXC-6	J1PVW4	7/17/2012	0.38	BJ	0.32	1.3		0.30	241		1.6
EXC-8	J1PVW6	7/17/2012	0.38	BJ	0.33	0.54	B	0.29	4.2	BCU	1.7
EXC-9	J1PVW7	7/17/2012	0.40	BJ	0.33	0.52	B	0.30	4.5	BCU	1.7
EXC-10	J1PVW8	7/17/2012	0.32	UJ	0.32	0.57	B	0.30	5.7	CU	1.6
EXC-11	J1PVW9	7/17/2012	0.43	BJ	0.32	1.4		0.30	4.1	BCU	1.6
EXC-12	J1PVX0	7/17/2012	0.40	BJ	0.33	0.92		0.30	3.8	BCU	1.7

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Nitrogen in Nitrite mg/kg	Nitrogen in Nitrite and Nitrate mg/kg	Sulfate mg/kg
EXC-7	J1PVW5/J1PVX1	7/17/2012	0.39	0.16	0.88
EXC-1	J1PVV9	7/17/2012	0.64	3.8	0.85
EXC-2	J1PVW0	7/17/2012	0.17	1.8	42.0
EXC-3	J1PVW1	7/17/2012	0.60	2.8	45.5
EXC-4	J1PVW2	7/17/2012	0.43	0.79	14.1
EXC-5	J1PVW3	7/17/2012	0.40	0.50	93.5
EXC-6	J1PVW4	7/17/2012	0.38	1.3	241.0
EXC-8	J1PVW6	7/17/2012	0.38	0.54	0.85
EXC-9	J1PVW7	7/17/2012	0.40	0.52	0.85
EXC-10	J1PVW8	7/17/2012	0.16	0.57	0.80
EXC-11	J1PVW9	7/17/2012	0.43	1.4	0.80
EXC-12	J1PVX0	7/17/2012	0.40	0.92	0.85

Statistical Computations

	Nitrogen in Nitrite	Nitrogen in Nitrite and Nitrate	Sulfate
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), lognormal and normal distribution rejected, use z-statistic.
N	12	12	12
% < Detection limit	17%	8%	58%
Mean	0.40	1.3	36.8
Standard deviation	0.14	1.1	70.4
95% UCL on mean	0.46	2.7	71.9
Maximum value	0.64	3.8	241
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	100 GW Protection	1000 GW Protection	25000 GW Protection
WAC 173-340 3-PART TEST			
95% UCL > Cleanup Limit?	NO	NA	NO
> 10% above Cleanup Limit?	NO	NA	NO
Any sample > 2X Cleanup Limit?	NO	NA	NO
WAC 173-340 Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NS
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/08/12
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100-D-14 Waste Site Maximum Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Hexavalent Chromium mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Selenium mg/kg	Q	PQL	Silver mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	0.155	U	0.155	0.0068	B	0.0059	0.27	U	0.27	1.2		0.88	0.16	U	0.16
Duplicate of J1PVW5	J1PVX1	7/17/2012	0.155	U	0.155	0.0067	U	0.0067	0.24	U	0.24	0.92	B	0.80	0.18	B	0.15
EXC-1	J1PVV9	7/17/2012	0.155	U	0.155	0.0069	U	0.0069	0.28	B	0.26	0.86	U	0.86	0.16	U	0.16
EXC-2	J1PVW0	7/17/2012	0.155	U	0.155	0.0065	U	0.0065	0.26	U	0.26	1.4		0.88	0.16	U	0.16
EXC-3	J1PVW1	7/17/2012	0.155	U	0.155	0.0057	U	0.0057	0.25	U	0.25	0.84	U	0.84	0.16	U	0.16
EXC-4	J1PVW2	7/17/2012	0.155	U	0.155	0.0063	U	0.0063	0.24	U	0.24	0.80	U	0.80	0.15	U	0.15
EXC-5	J1PVW3	7/17/2012	0.155	U	0.155	0.0052	U	0.0052	0.27	U	0.27	0.89	U	0.89	0.16	U	0.16
EXC-6	J1PVW4	7/17/2012	0.155	U	0.155	0.0053	U	0.0053	0.24	U	0.24	0.83	B	0.79	0.15	U	0.15
EXC-8	J1PVW6	7/17/2012	0.155	U	0.155	0.0048	U	0.0048	0.25	U	0.25	0.88	B	0.82	0.16	B	0.15
EXC-9	J1PVW7	7/17/2012	0.155	U	0.155	0.0057	U	0.0057	0.25	U	0.25	0.82	U	0.82	0.15	U	0.15
EXC-10	J1PVW8	7/17/2012	0.155	U	0.155	0.0051	U	0.0051	0.25	U	0.25	0.82	U	0.82	0.15	U	0.15
EXC-11	J1PVW9	7/17/2012	0.189		0.155	0.0058	U	0.0058	0.25	U	0.25	0.84	U	0.84	0.16	U	0.16
EXC-12	J1PVX0	7/17/2012	0.380		0.155	0.0047	U	0.0047	0.25	U	0.25	1.0		0.84	0.16	U	0.16

Statistical Computations

	Hexavalent Chromium	Mercury	Molybdenum	Selenium	Silver
% < Detection limit	83%	92%	92%	58%	83%
Maximum value	0.380	0.0068	0.28	1.4	0.18
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	2 River Protection	0.33 GW & River Protection	8 GW Protection	1 River Protection	0.73 River Protection
WAC 173-340 3-PART TEST					
Maximum > Cleanup Limit?	NO	NA	NO	YES	NA
> 10% above Cleanup Limit?	NO	NA	NO	YES	NA
Any sample > 2X Cleanup Limit?	NO	NA	NO	NO	NA
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.33 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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (0.73 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NS
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/07/12
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100-D-14 Waste Site Statistical Calculations

Verification Data - Staging Pile Area

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Arsenic Q	Arsenic PQL	Barium mg/kg	Barium Q	Barium PQL	Beryllium mg/kg	Beryllium Q	Beryllium PQL	Boron mg/kg	Boron Q	Boron PQL	Cadmium mg/kg	Cadmium Q	Cadmium PQL	Chromium mg/kg	Chromium Q	Chromium PQL	Cobalt mg/kg	Cobalt Q	Cobalt PQL	Copper mg/kg	Copper Q	Copper PQL
SPA-6	J1PVX7	7/17/2012	3.3		0.66	69.4		0.076	0.22		0.033	1.5	B	0.99	0.097	B	0.041	12.2		0.058	6.7	X	0.10	13.4		0.22
Duplicate of J1PVX7	J1PW04	7/17/2012	2.8		0.68	72.2		0.079	0.24		0.034	1.5	B	1.0	0.11	B	0.042	13.0		0.060	6.9	X	0.10	13.6		0.22
SPA-1	J1PVX2	7/17/2012	3.1		0.68	68.6		0.078	0.23		0.034	1.3	B	1.0	0.10	B	0.042	12.2		0.060	6.6	X	0.10	12.5		0.22
SPA-2	J1PVX3	7/17/2012	3.4		0.66	73.1		0.076	0.24		0.033	1.3	B	0.97	0.080	B	0.041	11.6		0.058	6.7	X	0.099	14.0		0.22
SPA-3	J1PVX4	7/17/2012	3.0		0.57	73.3		0.066	0.25		0.029	1.3	B	0.85	0.094	B	0.036	12.4		0.050	7.1	X	0.087	13.6		0.19
SPA-4	J1PVX5	7/17/2012	2.5		0.69	65.6		0.079	0.23		0.034	1.6	B	1.0	0.10	B	0.043	12.2		0.061	6.4	X	0.10	12.8		0.23
SPA-5	J1PVX6	7/17/2012	3.3		0.68	73.6		0.079	0.24		0.034	1.7	B	1.0	0.11	B	0.042	12.2		0.060	6.8	X	0.10	13.1		0.22
SPA-7	J1PVX8	7/17/2012	3.8		0.68	70.4		0.078	0.25		0.034	2.0	B	1.0	0.072	B	0.042	12.3		0.060	7.1	X	0.10	15.0		0.22
SPA-8	J1PVX9	7/17/2012	3.0		0.67	67.6		0.077	0.23		0.033	1.6	B	0.99	0.094	B	0.041	10.9		0.058	7.6	X	0.10	14.1		0.22
SPA-9	J1PW00	7/17/2012	3.3		0.64	70.0		0.073	0.24		0.032	1.5	B	0.95	0.12	B	0.040	13.8		0.056	7.6	X	0.097	14.1		0.21
SPA-10	J1PW01	7/17/2012	3.0		0.61	68.6		0.070	0.22		0.031	1.5	B	0.91	0.09	B	0.038	10.8		0.054	6.6	X	0.093	13.0		0.20
SPA-11	J1PW02	7/17/2012	3.1		0.61	70.4		0.071	0.25		0.031	1.4	B	0.91	0.11	B	0.038	14.2		0.054	7.3	X	0.093	14.4		0.20
SPA-12	J1PW03	7/17/2012	3.5		0.68	71.8		0.078	0.25		0.034	1.4	B	1.0	0.088	B	0.042	12.7		0.060	7.3	X	0.10	13.7		0.22

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
SPA-6	J1PVX7/J1PW04	7/17/2012	3.1	70.8	0.23	1.5	0.10	12.6	6.8	13.5
SPA-1	J1PVX2	7/17/2012	3.1	68.6	0.23	1.3	0.10	12.2	6.6	12.5
SPA-2	J1PVX3	7/17/2012	3.4	73.1	0.24	1.3	0.080	11.6	6.7	14.0
SPA-3	J1PVX4	7/17/2012	3.0	73.3	0.25	1.3	0.094	12.4	7.1	13.6
SPA-4	J1PVX5	7/17/2012	2.5	65.6	0.23	1.6	0.10	12.2	6.4	12.8
SPA-5	J1PVX6	7/17/2012	3.3	73.6	0.24	1.7	0.11	12.2	6.8	13.1
SPA-7	J1PVX8	7/17/2012	3.8	70.4	0.25	2.0	0.072	12.3	7.1	15.0
SPA-8	J1PVX9	7/17/2012	3.0	67.6	0.23	1.6	0.094	10.9	7.6	14.1
SPA-9	J1PW00	7/17/2012	3.3	70.0	0.24	1.5	0.12	13.8	7.6	14.1
SPA-10	J1PW01	7/17/2012	3.0	68.6	0.22	1.5	0.085	10.8	6.6	13.0
SPA-11	J1PW02	7/17/2012	3.1	70.4	0.25	1.4	0.11	14.2	7.3	14.4
SPA-12	J1PW03	7/17/2012	3.5	71.8	0.25	1.4	0.088	12.7	7.3	13.7

Statistical Computations

	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
N	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
Mean	3.2	70.3	0.24	1.5	0.096	12.3	7.0	13.7
Standard deviation	0.32	2.4	0.010	0.20	0.014	0.99	0.40	0.72
95% UCL on mean	3.4	71.6	0.24	1.6	0.10	12.9	7.2	14.0
Maximum value	3.8	73.6	0.25	2.0	0.12	14.2	7.6	15.0
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern **Date** 08/07/12 **Calc. No.** 0100D-CA-V0464 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 08/07/12
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 10 of 19

1 **100-D-14 Waste Site Statistical Calculations**

2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Lead			Manganese			Nickel			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite		
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-6	J1PVX7	7/17/2012	4.1		0.27	321		0.10	11.3		0.12	47.2		0.10	38.8	X	0.40	9.5		2.0	3.2		0.32	0.42	B	0.34
6	Duplicate of J1PVX7	J1PW04	7/17/2012	4.4		0.28	321		0.10	12.0		0.13	49.5		0.10	38.6	X	0.41	7.1		2.0	2.4	B	0.32	0.41	B	0.34
7	SPA-1	J1PVX2	7/17/2012	4.0		0.28	324		0.10	12.4		0.13	47.4		0.10	37.3	X	0.41	2.2	B	2.0	0.82	B	0.32	0.83	BM	0.35
8	SPA-2	J1PVX3	7/17/2012	3.9		0.27	324		0.099	11.3		0.12	47.0		0.093	36.1	X	0.40	2.0	U	2.0	0.71	B	0.32	0.39	B	0.34
9	SPA-3	J1PVX4	7/17/2012	4.0		0.23	335		0.087	12.0		0.11	46.0		0.081	37.7	X	0.34	2.3	B	2.0	0.87	B	0.32	0.35	U	0.35
10	SPA-4	J1PVX5	7/17/2012	4.1		0.28	307		0.10	11.3		0.13	45.6		0.10	37.3	X	0.42	3.0	B	2.0	1.6	B	0.32	0.40	B	0.34
11	SPA-5	J1PVX6	7/17/2012	4.1		0.28	322		0.10	12.3		0.13	45.5		0.10	37.8	X	0.41	2.6	B	2.0	1.3	B	0.31	0.43	B	0.33
12	SPA-7	J1PVX8	7/17/2012	4.1		0.28	311		0.10	12.1		0.13	47.3		0.10	38.1	X	0.41	13.8		2.0	4.7		0.32	0.44	B	0.34
13	SPA-8	J1PVX9	7/17/2012	4.1		0.27	346		0.10	10.9		0.12	54.1		0.10	40.8	X	0.40	3.3	B	2.0	1.5	B	0.31	0.39	B	0.34
14	SPA-9	J1PW00	7/17/2012	4.5		0.26	328		0.097	12.6		0.12	49.7		0.091	39.3	X	0.38	3.7	B	2.0	1.9	B	0.32	0.43	B	0.34
15	SPA-10	J1PW01	7/17/2012	4.5		0.25	309		0.093	10.9		0.11	45.5		0.087	38.1	X	0.37	4.9	B	2.1	4.4		0.33	0.44	B	0.35
16	SPA-11	J1PW02	7/17/2012	4.3		0.25	322		0.093	12.9		0.11	46.4		0.087	39.1	X	0.37	2.2	B	2.0	0.95	B	0.32	0.42	B	0.34
17	SPA-12	J1PW03	7/17/2012	4.6		0.28	343		0.10	11.7		0.13	49.9		0.10	40.1	X	0.41	3.0	B	2.0	1.5	B	0.31	0.41	B	0.34

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Lead	Manganese	Nickel	Vanadium	Zinc	Chloride	Nitrogen in Nitrate	Nitrogen in Nitrite
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	SPA-6	J1PVX7/J1PW04	7/17/2012	4.3	321	11.7	48.4	38.7	8.3	2.8	0.42
22	SPA-1	J1PVX2	7/17/2012	4.0	324	12.4	47.4	37.3	2.2	0.82	0.83
23	SPA-2	J1PVX3	7/17/2012	3.9	324	11.3	47.0	36.1	1.0	0.71	0.39
24	SPA-3	J1PVX4	7/17/2012	4.0	335	12.0	46.0	37.7	2.3	0.87	0.18
25	SPA-4	J1PVX5	7/17/2012	4.1	307	11.3	45.6	37.3	3.0	1.6	0.40
26	SPA-5	J1PVX6	7/17/2012	4.1	322	12.3	45.5	37.8	2.6	1.3	0.43
27	SPA-7	J1PVX8	7/17/2012	4.1	311	12.1	47.3	38.1	13.8	4.7	0.44
28	SPA-8	J1PVX9	7/17/2012	4.1	346	10.9	54.1	40.8	3.3	1.5	0.39
29	SPA-9	J1PW00	7/17/2012	4.5	328	12.6	49.7	39.3	3.7	1.9	0.43
30	SPA-10	J1PW01	7/17/2012	4.5	309	10.9	45.5	38.1	4.9	4.4	0.44
31	SPA-11	J1PW02	7/17/2012	4.3	322	12.9	46.4	39.1	2.2	1.0	0.42
32	SPA-12	J1PW03	7/17/2012	4.6	343	11.7	49.9	40.1	3.0	1.5	0.41

33 **Statistical Computations**

34		Lead	Manganese	Nickel	Vanadium	Zinc	Chloride	Nitrogen in Nitrate	Nitrogen in Nitrite
35	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), 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.
36	N	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	8%	0%	8%
38	Mean	4.2	324	11.8	47.7	38.4	4.2	1.9	0.43
39	Standard deviation	0.23	12.4	0.66	2.5	1.3	3.5	1.4	0.14
40	95% UCL on mean	4.3	331	12.2	48.9	39.1	6.8	3.0	0.50
41	Maximum value	4.6	346	12.9	54.1	40.8	13.8	4.7	0.83
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	10.2 GW & River Protection	512 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	100 GW Protection
43	**WAC 173-340 3-PART TEST**								
44	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO
47	**WAC 173-340 Compliance?**	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 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.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NKS
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/08/12
Job No. 14655

Calc. No. 0100D-CA-V0464
Checked I. B. Berezovskiy IBB

Rev. No. 0
Date 08/08/12
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100-D-14 Waste Site Statistical Calculations

Verification Data - Staging Pile Area

Sample Area	Sample Number	Sample Date	Nitrogen in Nitrite and Nitrate mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
SPA-6	J1PVX7	7/17/2012	3.1		0.30	106		1.8
Duplicate of J1PVX7	J1PW04	7/17/2012	2.2		0.30	86.3		1.8
SPA-1	J1PVX2	7/17/2012	0.31	B	0.31	2.8	BC	1.8
SPA-2	J1PVX3	7/17/2012	0.30	U	0.30	4.5	BC	1.8
SPA-3	J1PVX4	7/17/2012	0.31	B	0.31	9.0	C	1.8
SPA-4	J1PVX5	7/17/2012	1.3		0.30	3.0	BC	1.8
SPA-5	J1PVX6	7/17/2012	0.93		0.30	6.0	C	1.7
SPA-7	J1PVX8	7/17/2012	5.0	M	0.30	44.1		1.8
SPA-8	J1PVX9	7/17/2012	1.1		0.30	6.5	C	1.7
SPA-9	J1PW00	7/17/2012	1.6		0.30	22.1		1.8
SPA-10	J1PW01	7/17/2012	4.4	M	0.31	40.8		1.8
SPA-11	J1PW02	7/17/2012	0.57	B	0.31	3.5	BC	1.8
SPA-12	J1PW03	7/17/2012	1.2		0.30	4.2	BC	1.7

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Nitrogen in Nitrite and Nitrate mg/kg			Sulfate mg/kg		
SPA-6	J1PVX7/J1PW04	7/17/2012	2.7			96.2		
SPA-1	J1PVX2	7/17/2012	0.31			2.8		
SPA-2	J1PVX3	7/17/2012	0.15			4.5		
SPA-3	J1PVX4	7/17/2012	0.31			9.0		
SPA-4	J1PVX5	7/17/2012	1.3			3.0		
SPA-5	J1PVX6	7/17/2012	0.93			6.0		
SPA-7	J1PVX8	7/17/2012	5.0			44.1		
SPA-8	J1PVX9	7/17/2012	1.1			6.5		
SPA-9	J1PW00	7/17/2012	1.6			22.1		
SPA-10	J1PW01	7/17/2012	4.4			40.8		
SPA-11	J1PW02	7/17/2012	0.57			3.5		
SPA-12	J1PW03	7/17/2012	1.2			4.2		

Statistical Computations

	Nitrogen in Nitrite and Nitrate			Sulfate		
95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.			Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.		
N	12			12		
% < Detection limit	8%			0%		
Mean	1.6			20.2		
Standard deviation	1.6			28.1		
95% UCL on mean	4.9			33.5		
Maximum value	5.0			106		
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	1000		GW Protection	25000		GW Protection
WAC 173-340 3-PART TEST						
95% UCL > Cleanup Limit?	NA			NA		
> 10% above Cleanup Limit?	NA			NA		
Any sample > 2X Cleanup Limit?	NA			NA		
WAC 173-340 Compliance?	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.			Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.		

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator	N. K. Schiffern NS	**Date**	08/08/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No.	0
Date	08/08/12
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100-D-14 Waste Site Maximum Calculations

Verification Data - Staging Pilea Area

Sample Area	Sample Number	Sample Date	Selenium			Silver			Fluoride		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-6	J1PVX7	7/17/2012	1.4		0.87	0.17	B	0.16	0.84	U	0.84
Duplicate of J1PVX7	J1PW04	7/17/2012	0.94	B	0.89	0.17	U	0.17	0.84	U	0.84
SPA-1	J1PVX2	7/17/2012	0.88	U	0.88	0.16	U	0.16	0.84	UN	0.84
SPA-2	J1PVX3	7/17/2012	0.85	U	0.85	0.16	U	0.16	0.83	U	0.83
SPA-3	J1PVX4	7/17/2012	0.77	B	0.74	0.14	U	0.14	0.85	U	0.85
SPA-4	J1PVX5	7/17/2012	0.90	U	0.90	0.17	U	0.17	0.83	U	0.83
SPA-5	J1PVX6	7/17/2012	0.89	U	0.89	0.17	U	0.17	0.82	U	0.82
SPA-7	J1PVX8	7/17/2012	1.9		0.89	0.17	B	0.17	0.83	U	0.83
SPA-8	J1PVX9	7/17/2012	0.87	U	0.87	0.16	U	0.16	0.82	U	0.82
SPA-9	J1PW00	7/17/2012	0.83	U	0.83	0.15	U	0.15	0.83	U	0.83
SPA-10	J1PW01	7/17/2012	0.80	U	0.80	0.15	U	0.15	0.86	U	0.86
SPA-11	J1PW02	7/17/2012	0.80	U	0.80	0.15	U	0.15	0.91	B	0.84
SPA-12	J1PW03	7/17/2012	0.89	U	0.89	0.16	U	0.16	0.82	U	0.82

Statistical Computations

	Selenium	Silver	Fluoride
% < Detection limit	75%	83%	92%
Maximum value	1.9	0.17	0.91
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	1 River Protection	0.73 River Protection	96 GW Protection
WAC 173-340 3-PART TEST			
Maximum > Cleanup Limit?	YES	NA	NA
> 10% above Cleanup Limit?	YES	NA	NA
Any sample > 2X Cleanup Limit?	NO	NA	NA
3-Part Test Compliance?	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (0.73 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator	N. K. Schiffern NS	**Date**	08/08/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 08/08/12
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Ecology Software (MTCAStat) Results, 100-D-14 Waste Site Excavation

Arsenic 95% UCL Calculation

DATA	ID
4.1	J1PVW5/J1PVX1
3.3	J1PVV9
4.3	J1PVW0
3.3	J1PVW1
3.6	J1PVW2
4.4	J1PVW3
3.7	J1PVW4
3.7	J1PVW6
3.8	J1PVW7
3.0	J1PVW8
3.1	J1PVW9
3.6	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	3.7
Censored		Lognormal mean	3.7
Detection limit or PQL		Std. devn.	0.44
Method detection limit		Median	3.7
TOTAL	12	Min.	3.0
		Max.	4.4

Lognormal distribution? r-squared is: 0.973
Normal distribution? r-squared is: 0.968
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.9

Barium 95% UCL Calculation

DATA	ID
62.6	J1PVW5/J1PVX1
68.5	J1PVV9
67.0	J1PVW0
64.8	J1PVW1
74.6	J1PVW2
69.7	J1PVW3
58.3	J1PVW4
80.4	J1PVW6
75.0	J1PVW7
67.8	J1PVW8
69.7	J1PVW9
68.3	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	68.9
Censored		Lognormal mean	68.9
Detection limit or PQL		Std. devn.	5.9
Method detection limit		Median	68.4
TOTAL	12	Min.	58.3
		Max.	80.4

Lognormal distribution? r-squared is: 0.961
Normal distribution? r-squared is: 0.959
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 72.1

Beryllium 95% UCL Calculation

DATA	ID
0.21	J1PVW5/J1PVX1
0.23	J1PVV9
0.22	J1PVW0
0.20	J1PVW1
0.22	J1PVW2
0.25	J1PVW3
0.19	J1PVW4
0.28	J1PVW6
0.25	J1PVW7
0.24	J1PVW8
0.24	J1PVW9
0.26	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.23
Censored		Lognormal mean	0.23
Detection limit or PQL		Std. devn.	0.026
Method detection limit		Median	0.24
TOTAL	12	Min.	0.19
		Max.	0.28

Lognormal distribution? r-squared is: 0.983
Normal distribution? r-squared 0.984
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.25

Boron 95% UCL Calculation

DATA	ID
0.73	J1PVW5/J1PVX1
1.5	J1PVV9
0.50	J1PVW0
1.3	J1PVW1
1.1	J1PVW2
1.2	J1PVW3
0.95	J1PVW4
1.2	J1PVW6
0.94	J1PVW7
1.0	J1PVW8
1.1	J1PVW9
1.9	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	1.1
Censored		Lognormal mean	1.1
Detection limit or PQL		Std. devn.	0.36
Method detection limit		Median	1.1
TOTAL	12	Min.	0.50
		Max.	1.9

Lognormal distribution? r-squared is: 0.935
Normal distribution? r-squared is: 0.945
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.4

Cadmium 95% UCL Calculation

DATA	ID
0.11	J1PVW5/J1PVX1
0.11	J1PVV9
0.14	J1PVW0
0.11	J1PVW1
0.098	J1PVW2
0.16	J1PVW3
0.090	J1PVW4
0.099	J1PVW6
0.092	J1PVW7
0.10	J1PVW8
0.089	J1PVW9
0.11	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.11
Censored		Lognormal mean	0.11
Detection limit or PQL		Std. devn.	0.021
Method detection limit		Median	0.11
TOTAL	12	Min.	0.089
		Max.	0.16

Lognormal distribution? r-squared is: 0.853
Normal distribution? r-squared is: 0.799
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.12

Chromium 95% UCL Calculation

DATA	ID
13.3	J1PVW5/J1PVX1
12.1	J1PVV9
14.7	J1PVW0
10.9	J1PVW1
11.9	J1PVW2
16.0	J1PVW3
11.4	J1PVW4
13.2	J1PVW6
13.0	J1PVW7
11.9	J1PVW8
12.8	J1PVW9
13.1	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	12.9
Censored		Lognormal mean	12.9
Detection limit or PQL		Std. devn.	1.4
Method detection limit		Median	12.9
TOTAL	12	Min.	10.9
		Max.	16.0

Lognormal distribution? r-squared is: 0.942
Normal distribution? r-squared 0.918
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 13.6

Cobalt 95% UCL Calculation

DATA	ID
6.0	J1PVW5/J1PVX1
6.6	J1PVV9
6.4	J1PVW0
6.5	J1PVW1
6.4	J1PVW2
7.0	J1PVW3
6.5	J1PVW4
7.4	J1PVW6
6.6	J1PVW7
6.8	J1PVW8
6.9	J1PVW9
6.9	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	6.7
Censored		Lognormal mean	6.7
Detection limit or PQL		Std. devn.	0.37
Method detection limit		Median	6.6
TOTAL	12	Min.	6.0
		Max.	7.4

Lognormal distribution? r-squared is: 0.949
Normal distribution? r-squared is: 0.949
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 6.9

Copper 95% UCL Calculation

DATA	ID
15.4	J1PVW5/J1PVX1
16.6	J1PVV9
15.7	J1PVW0
15.5	J1PVW1
15.7	J1PVW2
20.5	J1PVW3
14.0	J1PVW4
17.3	J1PVW6
17.2	J1PVW7
14.5	J1PVW8
16.5	J1PVW9
16.2	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	16.3
Censored		Lognormal mean	16.3
Detection limit or PQL		Std. devn.	1.7
Method detection limit		Median	16.0
TOTAL	12	Min.	14.0
		Max.	20.5

Lognormal distribution? r-squared is: 0.901
Normal distribution? r-squared is: 0.863
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 17.1

Lead 95% UCL Calculation

DATA	ID
3.6	J1PVW5/J1PVX1
4.2	J1PVV9
3.8	J1PVW0
4.2	J1PVW1
3.7	J1PVW2
4.9	J1PVW3
3.7	J1PVW4
4.6	J1PVW6
3.9	J1PVW7
3.9	J1PVW8
4.1	J1PVW9
4.4	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	4.1
Censored		Lognormal mean	4.1
Detection limit or PQL		Std. devn.	0.40
Method detection limit		Median	4.0
TOTAL	12	Min.	3.6
		Max.	4.9

Lognormal distribution? r-squared is: 0.964
Normal distribution? r-squared 0.949
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.3

CALCULATION SHEET

Washington Closure Hanford

Originator	N. K. Schiffern	**Date**	08/07/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

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Ecology Software (MTCAStat) Results, 100-D-14 Waste Site Excavation

Manganese 95% UCL Calculation

DATA	ID
281	J1PVW5/J1PVX1
318	J1PVV9
299	J1PVW0
303	J1PVW1
296	J1PVW2
326	J1PVW3
297	J1PVW4
336	J1PVW6
301	J1PVW7
314	J1PVW8
321	J1PVW9
307	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	308
Censored		Lognormal mean	308
Detection limit or PQL		Std. devn.	15.3
Method detection limit		Median	305
TOTAL	12	Min.	281
		Max.	336

Lognormal distribution? r-squared is: 0.975
Normal distribution? r-squared is: 0.974
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 316

Nickel 95% UCL Calculation

DATA	ID
12.6	J1PVW5/J1PVX1
11.6	J1PVV9
13.2	J1PVW0
11.0	J1PVW1
11.4	J1PVW2
13.6	J1PVW3
10.9	J1PVW4
13.6	J1PVW6
12.5	J1PVW7
12.6	J1PVW8
11.8	J1PVW9
12.4	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	12.3
Censored		Lognormal mean	12.3
Detection limit or PQL		Std. devn.	0.93
Method detection limit		Median	12.5
TOTAL	12	Min.	10.9
		Max.	13.6

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

UCL (Land's method) is 12.8

Vanadium 95% UCL Calculation

DATA	ID
39.9	J1PVW5/J1PVX1
48.3	J1PVV9
40.5	J1PVW0
48.2	J1PVW1
41.1	J1PVW2
46.9	J1PVW3
49.9	J1PVW4
47.8	J1PVW6
44.2	J1PVW7
45.8	J1PVW8
45.3	J1PVW9
44.3	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	45.2
Censored		Lognormal mean	45.2
Detection limit or PQL		Std. devn.	3.3
Method detection limit		Median	45.6
TOTAL	12	Min.	39.9
		Max.	49.9

Lognormal distribution? r-squared is: 0.940
Normal distribution? r-squared 0.948
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 47.0

Zinc 95% UCL Calculation

DATA	ID
32.6	J1PVW5/J1PVX1
39.7	J1PVV9
35.8	J1PVW0
39.3	J1PVW1
34.3	J1PVW2
38.5	J1PVW3
35.6	J1PVW4
39.0	J1PVW6
35.9	J1PVW7
36.5	J1PVW8
38.5	J1PVW9
36.6	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	36.9
Censored		Lognormal mean	36.9
Detection limit or PQL		Std. devn.	2.2
Method detection limit		Median	36.6
TOTAL	12	Min.	32.6
		Max.	39.7

Lognormal distribution? r-squared is: 0.938
Normal distribution? r-squared is: 0.945
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 38.1

Chloride 95% UCL Calculation

DATA	ID
1.0	J1PVW5/J1PVX1
4.3	J1PVV9
62.3	J1PVW0
3.0	J1PVW1
2.4	J1PVW2
6.9	J1PVW3
5.0	J1PVW4
2.0	J1PVW6
1.9	J1PVW7
2.2	J1PVW8
0.95	J1PVW9
1.9	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	7.8
Censored		Lognormal mean	5.8
Detection limit or PQL		Std. devn.	17.2
Method detection limit		Median	2.3
TOTAL	12	Min.	1.0
		Max.	62.3

Lognormal distribution? r-squared is: 0.800
Normal distribution? r-squared is: 0.381
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 16.0

Fluoride 95% UCL Calculation

DATA	ID
1.9	J1PVW5/J1PVX1
0.41	J1PVV9
1.4	J1PVW0
1.3	J1PVW1
1.9	J1PVW2
1.8	J1PVW3
1.1	J1PVW4
0.40	J1PVW6
1.1	J1PVW7
0.39	J1PVW8
0.39	J1PVW9
0.41	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	1.0
Censored		Lognormal mean	1.1
Detection limit or PQL		Std. devn.	0.63
Method detection limit		Median	1.1
TOTAL	12	Min.	0.39
		Max.	1.9

Lognormal distribution? r-squared is: 0.827
Normal distribution? r-squared 0.865
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.3

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
0.65	J1PVW5/J1PVX1
3.5	J1PVV9
2.4	J1PVW0
2.6	J1PVW1
1.2	J1PVW2
1.1	J1PVW3
1.8	J1PVW4
1.1	J1PVW6
1.0	J1PVW7
1.2	J1PVW8
1.3	J1PVW9
1.4	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	1.6
Censored		Lognormal mean	1.6
Detection limit or PQL		Std. devn.	0.83
Method detection limit		Median	1.3
TOTAL	12	Min.	0.65
		Max.	3.5

Lognormal distribution? r-squared is: 0.940
Normal distribution? r-squared is: 0.847
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.2

Nitrogen in Nitrite 95% UCL Calculation

DATA	ID
0.39	J1PVW5/J1PVX1
0.64	J1PVV9
0.17	J1PVW0
0.60	J1PVW1
0.43	J1PVW2
0.40	J1PVW3
0.38	J1PVW4
0.38	J1PVW6
0.40	J1PVW7
0.16	J1PVW8
0.43	J1PVW9
0.40	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.40
Censored		Lognormal mean	0.40
Detection limit or PQL		Std. devn.	0.14
Method detection limit		Median	0.40
TOTAL	12	Min.	0.16
		Max.	0.64

Lognormal distribution? r-squared is: 0.786
Normal distribution? r-squared is: 0.856
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.46

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
0.16	J1PVW5/J1PVX1
3.8	J1PVV9
1.8	J1PVW0
2.8	J1PVW1
0.79	J1PVW2
0.50	J1PVW3
1.3	J1PVW4
0.54	J1PVW6
0.52	J1PVW7
0.57	J1PVW8
1.4	J1PVW9
0.92	J1PVX0

Number of samples		Uncensored values	
Uncensored	12	Mean	1.3
Censored		Lognormal mean	1.3
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	0.86
TOTAL	12	Min.	0.16
		Max.	3.8

Lognormal distribution? r-squared is: 0.959
Normal distribution? r-squared 0.828
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.7

CALCULATION SHEET

Washington Closure Hanford

Originator	N. K. Schiffern	**Date**	08/08/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

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Ecology Software (MTCAStat) Results, 100-D-14 Waste Site Excavation

1	**DATA**	**ID**	**Sulfate 95% UCL Calculation**			
2	3.7	J1PVW5/J1PVX1				
3	6.5	J1PVV9				
4	42.0	J1PVW0	Number of samples		Uncensored values	
5	45.5	J1PVW1	Uncensored	12	Mean	39.1
6	14.1	J1PVW2	Censored		Lognormal mean	37.7
7	93.5	J1PVW3	Detection limit or PQL		Std. devn.	69.2
8	241	J1PVW4	Method detection limit		Median	6.1
9	4.2	J1PVW6	TOTAL	12	Min.	3.7
10	4.5	J1PVW7			Max.	241
11	5.7	J1PVW8				
12	4.1	J1PVW9				
13	3.8	J1PVX0				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.839		r-squared is: 0.569	
16			Recommendations:			
17			Reject BOTH lognormal and normal distributions.			
18						
19			UCL (based on Z-statistic) is	71.9		
20						

CALCULATION SHEET

Washington Closure Hanford

Originator	N. K. Schiffern	**Date**	08/07/12	**Calc. No.**	0100D-CA-V0464
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-14 Waste Site Cleanup Verification 95% UCL Calculations				

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Ecology Software (MTCAStat) Results, 100-D-14 Waste Site Staging Pile Area

Arsenic 95% UCL Calculation

DATA	ID
3.1	J1PVX7/J1PW04
3.1	J1PVX2
3.4	J1PVX3
3.0	J1PVX4
2.5	J1PVX5
3.3	J1PVX6
3.8	J1PVX8
3.0	J1PVX9
3.3	J1PW00
3.0	J1PW01
3.1	J1PW02
3.5	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	3.2
Censored		Lognormal mean	3.2
Detection limit or PQL		Std. devn.	0.32
Method detection limit		Median	3.1
TOTAL	12	Min.	2.5
		Max.	3.8

Lognormal distribution? r-squared is: 0.909
Normal distribution? r-squared is: 0.922
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.4

Barium 95% UCL Calculation

DATA	ID
70.8	J1PVX7/J1PW04
68.6	J1PVX2
73.1	J1PVX3
73.3	J1PVX4
65.6	J1PVX5
73.6	J1PVX6
70.4	J1PVX8
67.6	J1PVX9
70.0	J1PW00
68.6	J1PW01
70.4	J1PW02
71.8	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	70.3
Censored		Lognormal mean	70.3
Detection limit or PQL		Std. devn.	2.4
Method detection limit		Median	70.4
TOTAL	12	Min.	65.6
		Max.	73.6

Lognormal distribution? r-squared is: 0.960
Normal distribution? r-squared is: 0.963
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 71.6

Beryllium 95% UCL Calculation

DATA	ID
0.23	J1PVX7/J1PW04
0.23	J1PVX2
0.24	J1PVX3
0.25	J1PVX4
0.23	J1PVX5
0.24	J1PVX6
0.25	J1PVX8
0.23	J1PVX9
0.24	J1PW00
0.22	J1PW01
0.25	J1PW02
0.25	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	0.24
Censored		Lognormal mean	0.24
Detection limit or PQL		Std. devn.	0.010
Method detection limit		Median	0.24
TOTAL	12	Min.	0.22
		Max.	0.25

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

UCL (based on Z-statistic) is 0.24

Boron 95% UCL Calculation

DATA	ID
1.5	J1PVX7/J1PW04
1.3	J1PVX2
1.3	J1PVX3
1.3	J1PVX4
1.6	J1PVX5
1.7	J1PVX6
2.0	J1PVX8
1.6	J1PVX9
1.5	J1PW00
1.5	J1PW01
1.4	J1PW02
1.4	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	1.5
Censored		Lognormal mean	1.5
Detection limit or PQL		Std. devn.	0.20
Method detection limit		Median	1.5
TOTAL	12	Min.	1.3
		Max.	2.0

Lognormal distribution? r-squared is: 0.906
Normal distribution? r-squared is: 0.872
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.6

Cadmium 95% UCL Calculation

DATA	ID
0.10	J1PVX7/J1PW04
0.095	J1PVX2
0.080	J1PVX3
0.094	J1PVX4
0.097	J1PVX5
0.11	J1PVX6
0.072	J1PVX8
0.094	J1PVX9
0.12	J1PW00
0.085	J1PW01
0.11	J1PW02
0.088	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	0.096
Censored		Lognormal mean	0.096
Detection limit or PQL		Std. devn.	0.014
Method detection limit		Median	0.095
TOTAL	12	Min.	0.072
		Max.	0.12

Lognormal distribution? r-squared is: 0.980
Normal distribution? r-squared is: 0.983
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.10

Chromium 95% UCL Calculation

DATA	ID
12.6	J1PVX7/J1PW04
12.2	J1PVX2
11.6	J1PVX3
12.4	J1PVX4
12.2	J1PVX5
12.2	J1PVX6
12.3	J1PVX8
10.9	J1PVX9
13.8	J1PW00
10.8	J1PW01
14.2	J1PW02
12.7	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	12.3
Censored		Lognormal mean	12.3
Detection limit or PQL		Std. devn.	0.99
Method detection limit		Median	12.3
TOTAL	12	Min.	10.8
		Max.	14.2

Lognormal distribution? r-squared is 0.929
Normal distribution? r-squared is 0.924
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.9

Cobalt 95% UCL Calculation

DATA	ID
6.8	J1PVX7/J1PW04
6.6	J1PVX2
6.7	J1PVX3
7.1	J1PVX4
6.4	J1PVX5
6.8	J1PVX6
7.1	J1PVX8
7.6	J1PVX9
7.6	J1PW00
6.6	J1PW01
7.3	J1PW02
7.3	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	7.0
Censored		Lognormal mean	7.0
Detection limit or PQL		Std. devn.	0.40
Method detection limit		Median	7.0
TOTAL	12	Min.	6.4
		Max.	7.6

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.951
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.2

Copper 95% UCL Calculation

DATA	ID
13.5	J1PVX7/J1PW04
12.5	J1PVX2
14.0	J1PVX3
13.6	J1PVX4
12.8	J1PVX5
13.1	J1PVX6
15.0	J1PVX8
14.1	J1PVX9
14.1	J1PW00
13.0	J1PW01
14.4	J1PW02
13.7	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	13.7
Censored		Lognormal mean	13.7
Detection limit or PQL		Std. devn.	0.72
Method detection limit		Median	13.7
TOTAL	12	Min.	12.5
		Max.	15.0

Lognormal distribution? r-squared is: 0.984
Normal distribution? r-squared is: 0.983
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.0

Lead 95% UCL Calculation

DATA	ID
4.3	J1PVX7/J1PW04
4.0	J1PVX2
3.9	J1PVX3
4.0	J1PVX4
4.1	J1PVX5
4.1	J1PVX6
4.1	J1PVX8
4.1	J1PVX9
4.5	J1PW00
4.5	J1PW01
4.3	J1PW02
4.6	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	4.2
Censored		Lognormal mean	4.2
Detection limit or PQL		Std. devn.	0.23
Method detection limit		Median	4.1
TOTAL	12	Min.	3.9
		Max.	4.6

Lognormal distribution? r-squared is 0.920
Normal distribution? r-squared is 0.913
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.3

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/07/12
Job No. 14655

Calc. No. 0100D-CA-V0464
Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 100-D-14 Waste Site Staging Pile Area

Manganese 95% UCL Calculation

DATA	ID
321	J1PVX7/J1PW04
324	J1PVX2
324	J1PVX3
335	J1PVX4
307	J1PVX5
322	J1PVX6
311	J1PVX8
346	J1PVX9
328	J1PW00
309	J1PW01
322	J1PW02
343	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	324
Censored		Lognormal mean	324
Detection limit or PQL		Std. devn.	12.4
Method detection limit		Median	323
TOTAL	12	Min.	307
		Max.	346

Lognormal distribution? r-squared is: 0.948
Normal distribution? r-squared is: 0.945
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 331

Nickel 95% UCL Calculation

DATA	ID
11.7	J1PVX7/J1PW04
12.4	J1PVX2
11.3	J1PVX3
12.0	J1PVX4
11.3	J1PVX5
12.3	J1PVX6
12.1	J1PVX8
10.9	J1PVX9
12.6	J1PW00
10.9	J1PW01
12.9	J1PW02
11.7	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	11.8
Censored		Lognormal mean	11.8
Detection limit or PQL		Std. devn.	0.66
Method detection limit		Median	11.9
TOTAL	12	Min.	10.9
		Max.	12.9

Lognormal distribution? r-squared is: 0.972
Normal distribution? r-squared is: 0.974
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.2

Vanadium 95% UCL Calculation

DATA	ID
48.4	J1PVX7/J1PW04
47.4	J1PVX2
47.0	J1PVX3
46.0	J1PVX4
45.6	J1PVX5
45.5	J1PVX6
47.3	J1PVX8
54.1	J1PVX9
49.7	J1PW00
45.5	J1PW01
46.4	J1PW02
49.9	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	47.7
Censored		Lognormal mean	47.7
Detection limit or PQL		Std. devn.	2.5
Method detection limit		Median	47.2
TOTAL	12	Min.	45.5
		Max.	54.1

Lognormal distribution? r-squared is 0.842
Normal distribution? r-squared is 0.825
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 48.9

Zinc 95% UCL Calculation

DATA	ID
38.7	J1PVX7/J1PW04
37.3	J1PVX2
36.1	J1PVX3
37.7	J1PVX4
37.3	J1PVX5
37.8	J1PVX6
38.1	J1PVX8
40.8	J1PVX9
39.3	J1PW00
38.1	J1PW01
39.1	J1PW02
40.1	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	38.4
Censored		Lognormal mean	38.4
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	38.1
TOTAL	12	Min.	36.1
		Max.	40.8

Lognormal distribution? r-squared is: 0.974
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 39.1

Chloride 95% UCL Calculation

DATA	ID
8.3	J1PVX7/J1PW04
2.2	J1PVX2
1.0	J1PVX3
2.3	J1PVX4
3.0	J1PVX5
2.6	J1PVX6
13.8	J1PVX8
3.3	J1PVX9
3.7	J1PW00
4.9	J1PW01
2.2	J1PW02
3.0	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	4.2
Censored		Lognormal mean	4.2
Detection limit or PQL		Std. devn.	3.5
Method detection limit		Median	3.0
TOTAL	12	Min.	1.0
		Max.	13.8

Lognormal distribution? r-squared is: 0.914
Normal distribution? r-squared is: 0.699
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 6.8

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
2.8	J1PVX7/J1PW04
0.82	J1PVX2
0.71	J1PVX3
0.87	J1PVX4
1.6	J1PVX5
1.3	J1PVX6
4.7	J1PVX8
1.5	J1PVX9
1.9	J1PW00
4.4	J1PW01
0.95	J1PW02
1.5	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	1.9
Censored		Lognormal mean	1.9
Detection limit or PQL		Std. devn.	1.4
Method detection limit		Median	1.5
TOTAL	12	Min.	0.71
		Max.	4.7

Lognormal distribution? r-squared is 0.936
Normal distribution? r-squared is 0.801
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.0

Nitrogen in Nitrite 95% UCL Calculation

DATA	ID
0.42	J1PVX7/J1PW04
0.83	J1PVX2
0.39	J1PVX3
0.18	J1PVX4
0.40	J1PVX5
0.43	J1PVX6
0.44	J1PVX8
0.39	J1PVX9
0.43	J1PW00
0.44	J1PW01
0.42	J1PW02
0.41	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	0.43
Censored		Lognormal mean	0.43
Detection limit or PQL		Std. devn.	0.14
Method detection limit		Median	0.42
TOTAL	12	Min.	0.18
		Max.	0.83

Lognormal distribution? r-squared is: 0.653
Normal distribution? r-squared is: 0.623
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.50

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
2.7	J1PVX7/J1PW04
0.31	J1PVX2
0.15	J1PVX3
0.31	J1PVX4
1.3	J1PVX5
0.93	J1PVX6
5.0	J1PVX8
1.1	J1PVX9
1.6	J1PW00
4.4	J1PW01
0.57	J1PW02
1.2	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	1.6
Censored		Lognormal mean	1.8
Detection limit or PQL		Std. devn.	1.6
Method detection limit		Median	1.2
TOTAL	12	Min.	0.15
		Max.	5.0

Lognormal distribution? r-squared is: 0.972
Normal distribution? r-squared is: 0.818
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.9

Sulfate 95% UCL Calculation

DATA	ID
96.2	J1PVX7/J1PW04
2.8	J1PVX2
4.5	J1PVX3
9.0	J1PVX4
3.0	J1PVX5
6.0	J1PVX6
44.1	J1PVX8
6.5	J1PVX9
22.1	J1PW00
40.8	J1PW01
3.5	J1PW02
4.2	J1PW03

Number of samples		Uncensored values	
Uncensored	12	Mean	20.2
Censored		Lognormal mean	20.1
Detection limit or PQL		Std. devn.	28.1
Method detection limit		Median	6.3
TOTAL	12	Min.	2.8
		Max.	96.2

Lognormal distribution? r-squared is 0.890
Normal distribution? r-squared is 0.668
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 33.5

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern **Date** 08/08/12 **Calc. No.** 0100D-CA-V0464 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 08/08/12
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 18 of 19

Duplicate Analysis - 100-D-14 Waste Site Excavation

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	6930		1.6	4.2		0.67	64.4		0.078	0.21		0.034	0.10	B	0.042	15800	J	14.4	13.0		0.059	6.0	X	0.10
Duplicate of J1PVW5	J1PVX1	7/17/2012	6940		1.4	3.9		0.62	60.7		0.071	0.20		0.031	0.12	B	0.038	15600	J	13.2	13.5		0.054	5.9	X	0.093

Analysis:

TDL		5	10	2	0.2	0.2	100	1	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	0.1%		5.9%			1.3%	3.8%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-14 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Magnesium			Manganese			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	15.2		0.22	15900		3.9	3.6		0.28	4950		3.8	279		0.10	12.7	X	0.13	907		41.8	1.2		0.88
Duplicate of J1PVW5	J1PVX1	7/17/2012	15.6		0.20	15300		3.5	3.5		0.25	4970		3.5	283		0.093	12.4	X	0.11	895		38.3	0.92	B	0.80

Analysis:

TDL		1	5	5	75	5	4	400	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	2.6%	3.8%		0.4%	1.4%			
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-14 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Silicon			Sodium			Vanadium			Zinc			Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	433	XJ	5.8	247		60.2	40.6		0.096	32.9		0.41	1.8	B	0.81	0.64	BJ	0.31	0.38	BJ	0.33	3.7	BC	1.7
Duplicate of J1PVW5	J1PVX1	7/17/2012	361	XJ	5.3	225		55.1	39.2		0.088	32.2		0.37	2.0	B	0.84	0.66	BJ	0.32	0.39	BJ	0.34	3.7	BC	1.8

Analysis:

TDL		2	50	2.5	1	5	0.75	0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	18.1%		3.5%	2.2%				
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NKS
Project 100-D Field Remediation
Subject 100-D-14 Waste Site Cleanup Verification 95% UCL Calculations

Date 08/08/12
Job No. 14655

Calc. No. 0100D-CA-V0464
Checked I. B. Berezovskiy

Rev. No. 0
Date 08/08/12
Sheet No. 19 of 19

Duplicate Analysis - 100-D-14 Waste Site 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-6	J1PVX7	7/17/2012	8080		1.6	3.3		0.66	69.4		0.076	0.22		0.033	1.5	B	0.99	0.10	B	0.041	6430		14.2	12.2		0.058
Duplicate of J1PVX7	J1PW04	7/17/2012	7990		1.6	2.8		0.68	72.2		0.079	0.24		0.034	1.5	B	1.0	0.11	B	0.042	6660		14.6	13.0		0.060

Analysis:

TDL		5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	1.1%		4.0%				3.5%	6.3%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 100-D-14 Waste Site Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Nickel			Potassium		
			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-6	J1PVX7	7/17/2012	6.7	X	0.10	13.4		0.22	18800		3.8	4.1		0.27	4700		3.7	321		0.10	11.3		0.12	1460		41.3
Duplicate of J1PVX7	J1PW04	7/17/2012	6.9	X	0.10	13.6		0.22	18700		3.9	4.4		0.28	4660		3.8	321		0.10	12.0		0.13	1450		42.5

Analysis:

TDL		2	1	5	5	75	5	4	400
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		1.5%	0.5%		0.9%	0.0%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-14 Waste Site Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Selenium			Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite		
			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-6	J1PVX7	7/17/2012	1.4		0.87	511		5.7	248		59.4	47.2		0.095	38.8	X	0.40	9.5		2.0	3.2		0.32	0.42	B	0.34
Duplicate of J1PVX7	J1PW04	7/17/2012	0.94	B	0.89	633		5.9	245		61.1	49.5		0.097	38.6	X	0.41	7.1		2.0	2.4	B	0.32	0.41	B	0.34

Analysis:

TDL		1	2	50	2.5	1	2	0.75	0.75
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		21.3%		4.8%	0.5%			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-14 Waste Site Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Nitrogen in Nitrite and Nitrate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-6	J1PVX7	7/17/2012	3.1		0.30	106		1.8
Duplicate of J1PVX7	J1PW04	7/17/2012	2.2		0.30	86.3		1.8

Analysis:

TDL		0.75	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)
	RPD		20.5%
	Difference > 2 TDL?	No - acceptable	Not applicable

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	6930		1.6	0.39	UJ	0.39	4.2		0.67	64.4		0.078	0.21		0.034	1.0	B	1.0
Duplicate of J1PVW5	J1PVX1	7/17/2012	6940		1.4	0.35	UJ	0.35	3.9		0.62	60.7		0.071	0.20		0.031	0.91	U	0.91
EXC-1	J1PVV9	7/17/2012	7480		1.5	0.38	UJ	0.38	3.3		0.66	68.5		0.076	0.23		0.033	1.5	B	0.97
EXC-2	J1PVW0	7/17/2012	7260		1.6	0.39	UJ	0.39	4.3		0.67	67.0		0.077	0.22		0.034	1.0	U	1.0
EXC-3	J1PVW1	7/17/2012	7050		1.5	0.37	UJ	0.37	3.3		0.64	64.8		0.074	0.20		0.032	1.3	B	0.95
EXC-4	J1PVW2	7/17/2012	7530		1.5	0.36	UJ	0.36	3.6		0.62	74.6		0.071	0.22		0.031	1.1	B	0.92
EXC-5	J1PVW3	7/17/2012	8560		1.6	0.39	UJ	0.39	4.4		0.68	69.7		0.078	0.25		0.034	1.2	B	1.0
EXC-6	J1PVW4	7/17/2012	6670		1.4	0.35	UJ	0.35	3.7		0.61	58.3		0.070	0.19		0.030	0.95	B	0.90
EXC-8	J1PVW6	7/17/2012	8840		1.5	0.36	UJ	0.36	3.7		0.63	80.4		0.072	0.28		0.031	1.2	B	0.93
EXC-9	J1PVW7	7/17/2012	7830		1.5	0.36	UJ	0.36	3.8		0.63	75.0		0.072	0.25		0.031	0.94	B	0.93
EXC-10	J1PVW8	7/17/2012	7960		1.5	0.36	UJ	0.36	3.0		0.63	67.8		0.072	0.24		0.031	1.0	B	0.93
EXC-11	J1PVW9	7/17/2012	8130		1.5	0.37	UJ	0.37	3.1		0.64	69.7		0.074	0.24		0.032	1.1	B	0.96
EXC-12	J1PVX0	7/17/2012	8280		1.5	0.37	UJ	0.37	3.6		0.65	68.3		0.074	0.26		0.032	1.9	B	0.96
SPA-6	J1PVX7	7/17/2012	8080		1.6	0.38	U	0.38	3.3		0.66	69.4		0.076	0.22		0.033	1.5	B	0.99
Duplicate of J1PVX7	J1PW04	7/17/2012	7990		1.6	0.39	U	0.39	2.8		0.68	72.2		0.079	0.24		0.034	1.5	B	1.0
SPA-1	J1PVX2	7/17/2012	8150		1.6	0.39	U	0.39	3.1		0.68	68.6		0.078	0.23		0.034	1.3	B	1.0
SPA-2	J1PVX3	7/17/2012	8610		1.5	0.38	U	0.38	3.4		0.66	73.1		0.076	0.24		0.033	1.3	B	0.97
SPA-3	J1PVX4	7/17/2012	8470		1.3	0.33	U	0.33	3.0		0.57	73.3		0.066	0.25		0.029	1.3	B	0.85
SPA-4	J1PVX5	7/17/2012	7920		1.6	0.40	U	0.40	2.5		0.69	65.6		0.079	0.23		0.034	1.6	B	1.0
SPA-5	J1PVX6	7/17/2012	7770		1.6	0.39	U	0.39	3.3		0.68	73.6		0.079	0.24		0.034	1.7	B	1.0
SPA-7	J1PVX8	7/17/2012	8160		1.6	0.39	U	0.39	3.8		0.68	70.4		0.078	0.25		0.034	2.0	B	1.0
SPA-8	J1PVX9	7/17/2012	8000		1.6	0.38	U	0.38	3.0		0.67	67.6		0.077	0.23		0.033	1.6	B	0.99
SPA-9	J1PW00	7/17/2012	8070		1.5	0.37	U	0.37	3.3		0.64	70.0		0.073	0.24		0.032	1.5	B	0.95
SPA-10	J1PW01	7/17/2012	7960		1.4	0.35	U	0.35	3.0		0.61	68.6		0.070	0.22		0.031	1.5	B	0.91
SPA-11	J1PW02	7/17/2012	8540		1.4	0.35	U	0.35	3.1		0.61	70.4		0.071	0.25		0.031	1.4	B	0.91
SPA-12	J1PW03	7/17/2012	8440		1.6	0.39	U	0.39	3.5		0.68	71.8		0.078	0.25		0.034	1.4	B	1.0
Equipment Blank	J1PW05	7/17/2012	277		1.4	0.34	U	0.34	0.59	U	0.59	2.5		0.068	0.065	B	0.030	0.88	U	0.88

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

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

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

B = blank contamination (inorganic constituents)

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

EXC = excavation

HEIS = Hanford Environmental Information System

J = estimate

M = sample duplicate precision not met.

N = recovery exceeds upper or lower control limits.

PCBs = polychlorinated biphenyls

PEST = pesticide

PQL = practical quantitation limit

Q = qualifier

R = detected, but due to a major QA deficiency, the data is unusable.

RAG = remedial action goal

SPA = staging pile area

SVOA = semivolatile organic analysis

TPH = total petroleum hydrocarbon

U = undetected

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

X (SVOAs) = MS, MSD: recovery exceeds upper or lower control limits.

Attachment	1	Sheet No.	1 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent 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
EXC-7	J1PVW5	7/17/2012	0.10	B	0.042	15800	J	14.4	13.0		0.059	6.0	X	0.10	15.2		0.22	0.155	U	0.155
Duplicate of J1PVW5	J1PVX1	7/17/2012	0.12	B	0.038	15600	J	13.2	13.5		0.054	5.9	X	0.093	15.6		0.20	0.155	U	0.155
EXC-1	J1PVV9	7/17/2012	0.11	B	0.041	7330	J	14.0	12.1		0.058	6.6	X	0.099	16.6		0.22	0.155	U	0.155
EXC-2	J1PVW0	7/17/2012	0.14	B	0.042	12000	J	14.4	14.7		0.059	6.4	X	0.10	15.7		0.22	0.155	U	0.155
EXC-3	J1PVW1	7/17/2012	0.11	B	0.040	9420	J	13.7	10.9		0.056	6.5	X	0.097	15.5		0.21	0.155	U	0.155
EXC-4	J1PVW2	7/17/2012	0.098	B	0.038	13700	J	13.2	11.9		0.054	6.4	X	0.094	15.7		0.20	0.155	U	0.155
EXC-5	J1PVW3	7/17/2012	0.16	B	0.042	12900	J	14.5	16.0		0.060	7.0	X	0.10	20.5		0.22	0.155	U	0.155
EXC-6	J1PVW4	7/17/2012	0.090	B	0.038	8980	J	13.0	11.4		0.053	6.5	X	0.092	14.0		0.20	0.155	U	0.155
EXC-8	J1PVW6	7/17/2012	0.099	B	0.039	4310	J	13.4	13.2		0.055	7.4	X	0.095	17.3		0.21	0.155	U	0.155
EXC-9	J1PVW7	7/17/2012	0.092	B	0.039	7670	J	13.4	13.0		0.055	6.6	X	0.095	17.2		0.21	0.155	U	0.155
EXC-10	J1PVW8	7/17/2012	0.10	B	0.039	3990	J	13.4	11.9		0.055	6.8	X	0.095	14.5		0.21	0.155	U	0.155
EXC-11	J1PVW9	7/17/2012	0.089	B	0.040	5710	J	13.8	12.8		0.057	6.9	X	0.098	16.5		0.21	0.189		0.155
EXC-12	J1PVX0	7/17/2012	0.11	B	0.040	6870	J	13.8	13.1		0.057	6.9	X	0.098	16.2		0.21	0.380		0.155
SPA-6	J1PVX7	7/17/2012	0.097	B	0.041	6430		14.2	12.2		0.058	6.7	X	0.10	13.4		0.22	0.155	U	0.155
Duplicate of J1PVX7	J1PW04	7/17/2012	0.11	B	0.042	6660		14.6	13.0		0.060	6.9	X	0.10	13.6		0.22	0.155	U	0.155
SPA-1	J1PVX2	7/17/2012	0.095	B	0.042	4020		14.5	12.2		0.060	6.6	X	0.10	12.5		0.22	0.155	U	0.155
SPA-2	J1PVX3	7/17/2012	0.080	B	0.041	3970		14.0	11.6		0.058	6.7	X	0.099	14.0		0.22	0.155	U	0.155
SPA-3	J1PVX4	7/17/2012	0.094	B	0.036	4190		12.2	12.4		0.050	7.1	X	0.087	13.6		0.19	0.155	U	0.155
SPA-4	J1PVX5	7/17/2012	0.097	B	0.043	4890		14.7	12.2		0.061	6.4	X	0.10	12.8		0.23	0.155	U	0.155
SPA-5	J1PVX6	7/17/2012	0.11	B	0.042	5290		14.6	12.2		0.060	6.8	X	0.10	13.1		0.22	0.155	U	0.155
SPA-7	J1PVX8	7/17/2012	0.072	B	0.042	4970		14.6	12.3		0.060	7.1	X	0.10	15.0		0.22	0.155	U	0.155
SPA-8	J1PVX9	7/17/2012	0.094	B	0.041	5520		14.2	10.9		0.058	7.6	X	0.10	14.1		0.22	0.155	U	0.155
SPA-9	J1PW00	7/17/2012	0.12	B	0.040	5590		13.6	13.8		0.056	7.6	X	0.097	14.1		0.21	0.155	U	0.155
SPA-10	J1PW01	7/17/2012	0.085	B	0.038	4710		13.1	10.8		0.054	6.6	X	0.093	13.0		0.20	0.155	U	0.155
SPA-11	J1PW02	7/17/2012	0.11	B	0.038	4580		13.1	14.2		0.054	7.3	X	0.093	14.4		0.20	0.155	U	0.155
SPA-12	J1PW03	7/17/2012	0.088	B	0.042	4200		14.5	12.7		0.060	7.3	X	0.10	13.7		0.22	0.155	U	0.155
Equipment Blank	J1PW05	7/17/2012	0.037	U	0.037	54.8		12.7	0.21		0.052	0.15	BX	0.090	0.23	B	0.20			

Attachment	1	Sheet No.	2 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	15900		3.9	3.6		0.28	4950		3.8	279		0.10	0.0068	B	0.0059	0.27	U	0.27
Duplicate of J1PVW5	J1PVX1	7/17/2012	15300		3.5	3.5		0.25	4970		3.5	283		0.093	0.0067	U	0.0067	0.24	U	0.24
EXC-1	J1PVV9	7/17/2012	17900		3.8	4.2		0.27	4680		3.7	318		0.099	0.0069	U	0.0069	0.28	B	0.26
EXC-2	J1PVW0	7/17/2012	16700		3.9	3.8		0.28	5470		3.8	299		0.10	0.0065	U	0.0065	0.26	U	0.26
EXC-3	J1PVW1	7/17/2012	18100		3.7	4.2		0.26	4570		3.6	303		0.097	0.0057	U	0.0057	0.25	U	0.25
EXC-4	J1PVW2	7/17/2012	17100		3.6	3.7		0.25	4730		3.5	296		0.094	0.0063	U	0.0063	0.24	U	0.24
EXC-5	J1PVW3	7/17/2012	18700		3.9	4.9		0.28	6000		3.8	326		0.10	0.0052	U	0.0052	0.27	U	0.27
EXC-6	J1PVW4	7/17/2012	18400		3.5	3.7		0.25	4730		3.4	297		0.092	0.0053	U	0.0053	0.24	U	0.24
EXC-8	J1PVW6	7/17/2012	19700		3.6	4.6		0.26	5000		3.5	336		0.095	0.0048	U	0.0048	0.25	U	0.25
EXC-9	J1PVW7	7/17/2012	17600		3.6	3.9		0.26	4690		3.5	301		0.095	0.0057	U	0.0057	0.25	U	0.25
EXC-10	J1PVW8	7/17/2012	18500		3.6	3.9		0.26	4630		3.5	314		0.095	0.0051	U	0.0051	0.25	U	0.25
EXC-11	J1PVW9	7/17/2012	18600		3.7	4.1		0.26	4660		3.6	321		0.098	0.0058	U	0.0058	0.25	U	0.25
EXC-12	J1PVX0	7/17/2012	18600		3.7	4.4		0.26	4700		3.6	307		0.098	0.0047	U	0.0047	0.25	U	0.25
SPA-6	J1PVX7	7/17/2012	18800		3.8	4.1		0.27	4700		3.7	321		0.10	0.0069	U	0.0069	0.26	U	0.26
Duplicate of J1PVX7	J1PW04	7/17/2012	18700		3.9	4.4		0.28	4660		3.8	321		0.10	0.0058	U	0.0058	0.27	U	0.27
SPA-1	J1PVX2	7/17/2012	18900		3.9	4.0		0.28	4330		3.8	324		0.10	0.0053	U	0.0053	0.27	U	0.27
SPA-2	J1PVX3	7/17/2012	19200		3.8	3.9		0.27	4140		3.7	324		0.099	0.0054	U	0.0054	0.26	U	0.26
SPA-3	J1PVX4	7/17/2012	19100		3.3	4.0		0.23	4310		3.2	335		0.087	0.0050	U	0.0050	0.23	U	0.23
SPA-4	J1PVX5	7/17/2012	18000		4.0	4.1		0.28	4190		3.9	307		0.10	0.0063	U	0.0063	0.27	U	0.27
SPA-5	J1PVX6	7/17/2012	18100		3.9	4.1		0.28	4490		3.8	322		0.10	0.0071	U	0.0071	0.27	U	0.27
SPA-7	J1PVX8	7/17/2012	19100		3.9	4.1		0.28	4730		3.8	311		0.10	0.0061	U	0.0061	0.27	U	0.27
SPA-8	J1PVX9	7/17/2012	20700		3.8	4.1		0.27	4640		3.7	346		0.10	0.0056	U	0.0056	0.26	U	0.26
SPA-9	J1PW00	7/17/2012	18800		3.7	4.5		0.26	4560		3.6	328		0.097	0.0065	U	0.0065	0.25	U	0.25
SPA-10	J1PW01	7/17/2012	18900		3.5	4.5		0.25	4280		3.4	309		0.093	0.0055	U	0.0055	0.24	U	0.24
SPA-11	J1PW02	7/17/2012	19100		3.5	4.3		0.25	4740		3.4	322		0.093	0.0072	U	0.0072	0.24	U	0.24
SPA-12	J1PW03	7/17/2012	19300		3.9	4.6		0.28	4480		3.8	343		0.10	0.0049	U	0.0049	0.27	U	0.27
Equipment Blank	J1PW05	7/17/2012	500		3.4	0.64		0.24	29.9		3.3	6.1		0.090	0.0054	U	0.0054	0.23	U	0.23

Attachment	1	Sheet No.	3 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	12.7	X	0.13	907		41.8	1.2		0.88	433	XJ	5.8	0.16	U	0.16	247		60.2
Duplicate of J1PVW5	J1PVX1	7/17/2012	12.4	X	0.11	895		38.3	0.92	B	0.80	361	XJ	5.3	0.18	B	0.15	225		55.1
EXC-1	J1PVV9	7/17/2012	11.6	X	0.12	1320		40.8	0.86	U	0.86	635	NXJ	5.6	0.16	U	0.16	190		58.7
EXC-2	J1PVW0	7/17/2012	13.2	X	0.13	1190		41.8	1.4		0.88	444	XJ	5.8	0.16	U	0.16	234		60.1
EXC-3	J1PVW1	7/17/2012	11.0	X	0.12	1060		39.9	0.84	U	0.84	472	XJ	5.5	0.16	U	0.16	281		57.4
EXC-4	J1PVW2	7/17/2012	11.4	X	0.12	1030		38.4	0.80	U	0.80	415	XJ	5.3	0.15	U	0.15	238		55.2
EXC-5	J1PVW3	7/17/2012	13.6	X	0.13	1240		42.3	0.89	U	0.89	471	XJ	5.8	0.16	U	0.16	348		60.8
EXC-6	J1PVW4	7/17/2012	10.9	X	0.11	914		37.8	0.83	B	0.79	432	XJ	5.2	0.15	U	0.15	297		54.4
EXC-8	J1PVW6	7/17/2012	13.6	X	0.12	1680		38.9	0.88	B	0.82	464	XJ	5.4	0.16	B	0.15	188		56.0
EXC-9	J1PVW7	7/17/2012	12.5	X	0.12	1130		38.9	0.82	U	0.82	463	XJ	5.4	0.15	U	0.15	219		55.9
EXC-10	J1PVW8	7/17/2012	12.6	X	0.12	1360		38.9	0.82	U	0.82	444	XJ	5.4	0.15	U	0.15	203		55.9
EXC-11	J1PVW9	7/17/2012	11.8	X	0.12	1320		40.0	0.84	U	0.84	646	XJ	5.5	0.16	U	0.16	231		57.6
EXC-12	J1PVX0	7/17/2012	12.4	X	0.12	2040		40.2	1.0		0.84	544	XJ	5.5	0.16	U	0.16	195		57.8
SPA-6	J1PVX7	7/17/2012	11.3		0.12	1460		41.3	1.4		0.87	511		5.7	0.17	B	0.16	248		59.4
Duplicate of J1PVX7	J1PW04	7/17/2012	12.0		0.13	1450		42.5	0.94	B	0.89	633		5.9	0.17	U	0.17	245		61.1
SPA-1	J1PVX2	7/17/2012	12.4		0.13	1570		42.1	0.88	U	0.88	758	N	5.8	0.16	U	0.16	203		60.6
SPA-2	J1PVX3	7/17/2012	11.3		0.12	1610		40.8	0.85	U	0.85	544		5.6	0.16	U	0.16	205		58.7
SPA-3	J1PVX4	7/17/2012	12.0		0.11	1640		35.5	0.77	B	0.74	536		4.9	0.14	U	0.14	188		51.1
SPA-4	J1PVX5	7/17/2012	11.3		0.13	1620		42.8	0.90	U	0.90	553		5.9	0.17	U	0.17	209		61.6
SPA-5	J1PVX6	7/17/2012	12.3		0.13	1510		42.4	0.89	U	0.89	569		5.8	0.17	U	0.17	207		61.0
SPA-7	J1PVX8	7/17/2012	12.1		0.13	1570		42.3	1.9		0.89	718		5.8	0.17	B	0.17	217		60.9
SPA-8	J1PVX9	7/17/2012	10.9		0.12	1560		41.3	0.87	U	0.87	527		5.7	0.16	U	0.16	221		59.5
SPA-9	J1PW00	7/17/2012	12.6		0.12	1530		39.6	0.83	U	0.83	542		5.5	0.15	U	0.15	209		57.0
SPA-10	J1PW01	7/17/2012	10.9		0.11	1550		38.0	0.80	U	0.80	602		5.2	0.15	U	0.15	210		54.7
SPA-11	J1PW02	7/17/2012	12.9		0.11	1640		38.1	0.80	U	0.80	547		5.3	0.15	U	0.15	206		54.9
SPA-12	J1PW03	7/17/2012	11.7		0.13	1630		42.3	0.89	U	0.89	635		5.8	0.16	U	0.16	185		60.8
Equipment Blank	J1PW05	7/17/2012	0.17	B	0.11	59	B	36.9	0.77	U	0.77	174		5.1	0.14	U	0.14	53.2	U	53.2

Attachment	1	Sheet No.	4 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	40.6		0.096	32.9		0.41
Duplicate of J1PVW5	J1PVX1	7/17/2012	39.2		0.088	32.2		0.37
EXC-1	J1PVV9	7/17/2012	48.3		0.094	39.7		0.40
EXC-2	J1PVW0	7/17/2012	40.5		0.096	35.8		0.41
EXC-3	J1PVW1	7/17/2012	48.2		0.092	39.3		0.39
EXC-4	J1PVW2	7/17/2012	41.1		0.088	34.3		0.37
EXC-5	J1PVW3	7/17/2012	46.9		0.097	38.5		0.41
EXC-6	J1PVW4	7/17/2012	49.9		0.087	35.6		0.37
EXC-8	J1PVW6	7/17/2012	47.8		0.089	39.0		0.38
EXC-9	J1PVW7	7/17/2012	44.2		0.089	35.9		0.38
EXC-10	J1PVW8	7/17/2012	45.8		0.089	36.5		0.38
EXC-11	J1PVW9	7/17/2012	45.3		0.092	38.5		0.39
EXC-12	J1PVX0	7/17/2012	44.3		0.092	36.6		0.39
SPA-6	J1PVX7	7/17/2012	47.2		0.095	38.8	X	0.40
Duplicate of J1PVX7	J1PW04	7/17/2012	49.5		0.097	38.6	X	0.41
SPA-1	J1PVX2	7/17/2012	47.4		0.097	37.3	X	0.41
SPA-2	J1PVX3	7/17/2012	47.0		0.093	36.1	X	0.40
SPA-3	J1PVX4	7/17/2012	46.0		0.081	37.7	X	0.34
SPA-4	J1PVX5	7/17/2012	45.6		0.098	37.3	X	0.42
SPA-5	J1PVX6	7/17/2012	45.5		0.097	37.8	X	0.41
SPA-7	J1PVX8	7/17/2012	47.3		0.097	38.1	X	0.41
SPA-8	J1PVX9	7/17/2012	54.1		0.095	40.8	X	0.40
SPA-9	J1PW00	7/17/2012	49.7		0.091	39.3	X	0.38
SPA-10	J1PW01	7/17/2012	45.5		0.087	38.1	X	0.37
SPA-11	J1PW02	7/17/2012	46.4		0.087	39.1	X	0.37
SPA-12	J1PW03	7/17/2012	49.9		0.097	40.1	X	0.41
Equipment Blank	J1PW05	7/17/2012	1.6	B	0.085	1.8	XC	0.36

Attachment	1	Sheet No.	5 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Anions

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-7	J1PVW5	7/17/2012	0.38	U	0.38	2.0	U	2.0	1.8	B	0.81	0.64	BJ	0.31	0.38	BJ	0.33	0.31	U	0.31
Duplicate of J1PVW5	J1PVX1	7/17/2012	0.40	U	0.40	2.0	U	2.0	2.0	B	0.84	0.66	BJ	0.32	0.39	BJ	0.34	0.31	U	0.31
EXC-1	J1PVV9	7/17/2012	0.39	U	0.39	4.3	B	2.0	0.82	UN	0.82	3.5	J	0.31	0.64	BJ	0.33	3.8		0.30
EXC-2	J1PVW0	7/17/2012	0.74	B	0.39	62.3		2.0	1.4	B	0.83	2.4	BJ	0.32	0.34	UJ	0.34	1.8		0.30
EXC-3	J1PVW1	7/17/2012	0.37	U	0.37	3.0	B	1.9	1.3	B	0.79	2.6	J	0.30	0.60	BJ	0.32	2.8		0.30
EXC-4	J1PVW2	7/17/2012	0.40	U	0.40	2.4	B	2.0	1.9	B	0.84	1.2	BJ	0.32	0.43	BJ	0.34	0.79		0.30
EXC-5	J1PVW3	7/17/2012	0.40	U	0.40	6.9		2.0	1.8	B	0.85	1.1	BJ	0.32	0.40	BJ	0.35	0.50	B	0.31
EXC-6	J1PVW4	7/17/2012	0.36	U	0.36	5.0		1.8	1.1	B	0.77	1.8	BJ	0.29	0.38	BJ	0.32	1.3		0.30
EXC-8	J1PVW6	7/17/2012	0.38	U	0.38	2.0	B	1.9	0.80	U	0.80	1.1	BJ	0.31	0.38	BJ	0.33	0.54	B	0.29
EXC-9	J1PVW7	7/17/2012	0.38	U	0.38	1.9	B	1.9	1.1	B	0.81	1.0	BJ	0.31	0.40	BJ	0.33	0.52	B	0.30
EXC-10	J1PVW8	7/17/2012	0.37	U	0.37	2.2	B	1.9	0.78	U	0.78	1.2	BJ	0.30	0.32	UJ	0.32	0.57	B	0.30
EXC-11	J1PVW9	7/17/2012	0.37	U	0.37	1.9	U	1.9	0.78	U	0.78	1.3	BJ	0.30	0.43	BJ	0.32	1.4		0.30
EXC-12	J1PVX0	7/17/2012	0.38	U	0.38	1.9	B	1.9	0.81	U	0.81	1.4	BJ	0.31	0.40	BJ	0.33	0.92		0.30
SPA-6	J1PVX7	7/17/2012	0.39	U	0.39	9.5		2.0	0.84	U	0.84	3.2		0.32	0.42	B	0.34	3.1		0.30
Duplicate of J1PVX7	J1PW04	7/17/2012	0.39	U	0.39	7.1		2.0	0.84	U	0.84	2.4	B	0.32	0.41	B	0.34	2.2		0.30
SPA-1	J1PVX2	7/17/2012	0.40	U	0.40	2.2	B	2.0	0.84	UN	0.84	0.82	B	0.32	0.83	BM	0.35	0.31	B	0.31
SPA-2	J1PVX3	7/17/2012	0.39	U	0.39	2.0	U	2.0	0.83	U	0.83	0.71	B	0.32	0.39	B	0.34	0.30	U	0.30
SPA-3	J1PVX4	7/17/2012	0.40	U	0.40	2.3	B	2.0	0.85	U	0.85	0.87	B	0.32	0.35	U	0.35	0.31	B	0.31
SPA-4	J1PVX5	7/17/2012	0.39	U	0.39	3.0	B	2.0	0.83	U	0.83	1.6	B	0.32	0.40	B	0.34	1.3		0.30
SPA-5	J1PVX6	7/17/2012	0.39	U	0.39	2.6	B	2.0	0.82	U	0.82	1.3	B	0.31	0.43	B	0.33	0.93		0.30
SPA-7	J1PVX8	7/17/2012	0.39	U	0.39	13.8		2.0	0.83	U	0.83	4.7		0.32	0.44	B	0.34	5.0	M	0.30
SPA-8	J1PVX9	7/17/2012	0.39	U	0.39	3.3	B	2.0	0.82	U	0.82	1.5	B	0.31	0.39	B	0.34	1.1		0.30
SPA-9	J1PW00	7/17/2012	0.39	U	0.39	3.7	B	2.0	0.83	U	0.83	1.9	B	0.32	0.43	B	0.34	1.6		0.30
SPA-10	J1PW01	7/17/2012	0.41	U	0.41	4.9	B	2.1	0.86	U	0.86	4.4		0.33	0.44	B	0.35	4.4	M	0.31
SPA-11	J1PW02	7/17/2012	0.40	U	0.40	2.2	B	2.0	0.91	B	0.84	0.95	B	0.32	0.42	B	0.34	0.57	B	0.31
SPA-12	J1PW03	7/17/2012	0.39	U	0.39	3.0	B	2.0	0.82	U	0.82	1.5	B	0.31	0.41	B	0.34	1.2		0.30

Attachment	1	Sheet No.	6 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sampling Results - Anions and Physical

Sample Location	HEIS Number	Sample Date	Phosphorous in phosphate			Sulfate			Percent moisture (wet sample)			pH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	%	Q	PQL	pH	Q	PQL
EXC-7	J1PVW5	7/17/2012	1.2	UJ	1.2	3.7	BCU	1.7	3.0		0.10	9.21	J	0.100
Duplicate of J1PVW5	J1PVX1	7/17/2012	1.3	UJ	1.3	3.7	BCU	1.8	3.5		0.10	9.27	J	0.100
EXC-1	J1PVV9	7/17/2012	1.2	UNJ	1.2	6.5	CU	1.7	2.4		0.10	8.91	J	0.100
EXC-2	J1PVW0	7/17/2012	1.3	UJ	1.3	42.0		1.7	3.8		0.10	8.55	J	0.100
EXC-3	J1PVW1	7/17/2012	1.2	UJ	1.2	45.5		1.7	2.2		0.10	9.19	J	0.100
EXC-4	J1PVW2	7/17/2012	1.3	UJ	1.3	14.1		1.8	2.9		0.10	9.11	J	0.100
EXC-5	J1PVW3	7/17/2012	1.3	UJ	1.3	93.5		1.8	3.9		0.10	9.18	J	0.100
EXC-6	J1PVW4	7/17/2012	1.2	UJ	1.2	241		1.6	1.4		0.10	8.74	J	0.100
EXC-8	J1PVW6	7/17/2012	1.2	UJ	1.2	4.2	BCU	1.7	0.69		0.10	9.02	J	0.100
EXC-9	J1PVW7	7/17/2012	1.2	UJ	1.2	4.5	BCU	1.7	3.2		0.10	9.08	J	0.100
EXC-10	J1PVW8	7/17/2012	1.2	UJ	1.2	5.7	CU	1.6	1.4		0.10	8.91	J	0.100
EXC-11	J1PVW9	7/17/2012	1.2	UJ	1.2	4.1	BCU	1.6	2.4		0.10	9.15	J	0.100
EXC-12	J1PVX0	7/17/2012	1.2	UJ	1.2	3.8	BCU	1.7	0.86		0.10	9.38	J	0.100
SPA-6	J1PVX7	7/17/2012	1.3	U	1.3	106		1.8	3.5		0.10	8.85		0.100
Duplicate of J1PVX7	J1PW04	7/17/2012	1.3	U	1.3	86.3		1.8	3.5		0.10	8.91		0.100
SPA-1	J1PVX2	7/17/2012	1.3	U	1.3	2.8	BC	1.8	4.6		0.10	9.03		0.100
SPA-2	J1PVX3	7/17/2012	1.3	U	1.3	4.5	BC	1.8	3.3		0.10	8.98		0.100
SPA-3	J1PVX4	7/17/2012	1.3	U	1.3	9.0	C	1.8	3.0		0.10	9.05		0.100
SPA-4	J1PVX5	7/17/2012	1.3	U	1.3	3.0	BC	1.8	5.2		0.10	9.09		0.100
SPA-5	J1PVX6	7/17/2012	1.2	U	1.2	6.0	C	1.7	5.1		0.10	8.96		0.100
SPA-7	J1PVX8	7/17/2012	1.3	U	1.3	44.1		1.8	3.1		0.10	8.96		0.100
SPA-8	J1PVX9	7/17/2012	1.2	U	1.2	6.5	C	1.7	4.6		0.10	9.16		0.100
SPA-9	J1PW00	7/17/2012	1.3	U	1.3	22.1		1.8	5.9		0.10	8.99		0.100
SPA-10	J1PW01	7/17/2012	1.3	U	1.3	40.8		1.8	4.6		0.10	8.87		0.100
SPA-11	J1PW02	7/17/2012	1.3	U	1.3	3.5	BC	1.8	5.7		0.10	9.08		0.100
SPA-12	J1PW03	7/17/2012	1.2	U	1.2	4.2	BC	1.7	4.9		0.10	9.08		0.100
Equipment Blank	J1PW05	7/17/2012							0.10	U	0.10			

Attachment	1	Sheet No.	7 of 18
Originator	N. K. Schiffern	Date	08/08/12
Checked	I. B. Berezovskiy	Date	08/08/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVW5, EXC-7			J1PVX1, Duplicate of J1PVW5			J1PVV9, EXC-1			J1PVW0, EXC-2		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	27	U	27	29	U	29
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	21	U	21	23	U	23
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	14	U	14	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
2,4,6-Trichlorophenol	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
2,4-Dichlorophenol	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
2,4-Dimethylphenol	SVOA	64	U	64	67	U	67	64	U	64	68	U	68
2,4-Dinitrophenol	SVOA	320	UJ	320	340	UXJ	340	320	UJ	320	340	UJ	340
2,4-Dinitrotoluene	SVOA	64	U	64	67	U	67	64	U	64	68	U	68
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	27	U	27	29	U	29
2-Chloronaphthalene	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
2-Chlorophenol	SVOA	20	U	20	21	U	21	20	U	20	22	U	22
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	18	U	18	20	U	20
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	49	U	49	51	U	51	48	U	48	52	U	52
2-Nitrophenol	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	34	U	34	32	U	32	34	U	34
3,3'-Dichlorobenzidine	SVOA	88	UJ	88	91	UJ	91	87	UJ	87	93	UJ	93
3-Nitroaniline	SVOA	71	U	71	74	U	74	71	U	71	75	U	75
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	340	U	340	320	U	320	340	U	340
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	18	U	18	20	U	20
4-Chloro-3-methylphenol	SVOA	64	U	64	67	U	67	64	U	64	68	U	68
4-Chloroaniline	SVOA	80	U	80	83	U	83	79	U	79	85	U	85
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	20	U	20	22	U	22
4-Nitroaniline	SVOA	71	U	71	74	U	74	70	U	70	75	U	75
4-Nitrophenol	SVOA	94	U	94	99	U	99	94	U	94	100	U	100
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	11	U	11
Acenaphthylene	SVOA	17	U	17	17	U	17	16	U	16	18	U	18
Anthracene	SVOA	17	U	17	17	U	17	16	U	16	18	U	18
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	19	U	19	21	U	21
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	19	U	19	21	U	21
Benzo(b)fluoranthene	SVOA	25	U	25	27	U	27	25	U	25	27	U	27
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	17	U	17
Benzo(k)fluoranthene	SVOA	39	U	39	41	U	41	39	U	39	41	U	41
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	22	U	22	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	22	U	22	24	U	24
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	16	U	16	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	47	U	47	45	U	45	47	U	47
Butylbenzylphthalate	SVOA	42	U	42	44	U	44	42	U	42	44	U	44
Carbazole	SVOA	35	U	35	37	U	37	35	U	35	37	U	37
Chrysene	SVOA	26	U	26	27	U	27	26	U	26	28	U	28
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	28	U	28	30	U	30
Di-n-octylphthalate	SVOA	14	U	14	15	U	15	14	U	14	15	U	15
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	18	U	18	20	U	20
Dibenzofuran	SVOA	19	U	19	20	U	20	19	U	19	21	U	21
Diethyl phthalate	SVOA	25	U	25	26	U	26	25	U	25	27	U	27
Dimethyl phthalate	SVOA	22	U	22	23	U	23	22	U	22	24	U	24
Fluoranthene	SVOA	35	U	35	37	U	37	35	U	35	37	U	37
Fluorene	SVOA	18	U	18	18	U	18	17	U	17	19	U	19
Hexachlorobenzene	SVOA	28	U	28	29	U	29	28	U	28	30	U	30
Hexachlorobutadiene	SVOA	9.7	U	9.7	10	U	10	9.7	U	9.7	10	U	10
Hexachlorocyclopentadiene	SVOA	49	U	49	51	U	51	48	U	48	52	U	52
Hexachloroethane	SVOA	21	U	21	22	U	22	21	U	21	22	U	22
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	21	U	21	23	U	23
Isophorone	SVOA	17	U	17	17	U	17	16	U	16	18	U	18
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	31	U	31	30	U	30	32	U	32
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	20	U	20	22	U	22
Naphthalene	SVOA	30	U	30	31	U	31	30	U	30	32	U	32
Nitrobenzene	SVOA	21	U	21	22	U	22	21	U	21	23	U	23
Pentachlorophenol	SVOA	320	U	320	340	U	340	320	U	320	340	U	340
Phenanthrene	SVOA	17	U	17	17	U	17	16	U	16	18	U	18
Phenol	SVOA	18	U	18	18	U	18	17	U	17	19	U	19
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	8 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVW1, EXC-3			J1PVW2, EXC-4			J1PVW3, EXC-5			J1PVW4, EXC-6		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28	28	U	28	26	U	26
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4-Dimethylphenol	SVOA	67	U	67	66	U	66	66	U	66	62	U	62
2,4-Dinitrophenol	SVOA	340	UJ	340	330	UJ	330	330	UJ	330	310	UJ	310
2,4-Dinitrotoluene	SVOA	67	U	67	66	U	66	66	U	66	62	U	62
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28	28	U	28	26	U	26
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	50	U	50	50	U	50	50	U	50	47	U	47
2-Nitrophenol	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	33	U	33	33	U	33	31	U	31
3,3'-Dichlorobenzidine	SVOA	91	UJ	91	90	UJ	90	90	UJ	90	84	UJ	84
3-Nitroaniline	SVOA	74	U	74	73	U	73	73	U	73	68	U	68
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	330	U	330	330	U	330	310	U	310
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	67	U	67	66	U	66	66	U	66	62	U	62
4-Chloroaniline	SVOA	83	U	83	82	U	82	82	U	82	77	U	77
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
4-Nitroaniline	SVOA	73	U	73	72	U	72	73	U	73	68	U	68
4-Nitrophenol	SVOA	98	U	98	97	U	97	97	U	97	91	U	91
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	9.6	U	9.6
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	20	U	20	19	U	19
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	40	U	40	40	U	40	40	U	40	37	U	37
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	46	U	46	46	U	46	43	U	43
Butylbenzylphthalate	SVOA	43	U	43	43	U	43	43	U	43	40	U	40
Carbazole	SVOA	36	U	36	36	U	36	36	U	36	34	U	34
Chrysene	SVOA	27	U	27	27	U	27	27	U	27	25	U	25
Di-n-butylphthalate	SVOA	29	U	29	29	U	29	29	U	29	27	U	27
Di-n-octylphthalate	SVOA	15	U	15	14	U	14	14	U	14	13	U	13
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	19	U	19
Diethyl phthalate	SVOA	26	U	26	26	U	26	26	U	26	24	U	24
Dimethyl phthalate	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Fluoranthene	SVOA	36	U	36	36	U	36	36	U	36	34	U	34
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	29	U	29	29	U	29	29	U	29	27	U	27
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	10	U	10	9.4	U	9.4
Hexachlorocyclopentadiene	SVOA	50	U	50	50	U	50	50	U	50	47	U	47
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	31	U	31	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
Naphthalene	SVOA	31	U	31	31	U	31	31	U	31	29	U	29
Nitrobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21
Pentachlorophenol	SVOA	330	U	330	330	U	330	330	U	330	310	U	310
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Phenol	SVOA	18	U	18	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	11	U	11

Attachment	1	Sheet No.	9 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVW6, EXC-8			J1PVW7, EXC-9			J1PVW8, EXC-10			J1PVW9, EXC-11		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	26	U	26	27	U	27	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	11	U	11	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
2,4,6-Trichlorophenol	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
2,4-Dichlorophenol	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
2,4-Dimethylphenol	SVOA	62	U	62	64	U	64	64	U	64	63	U	63
2,4-Dinitrophenol	SVOA	310	UJ	310	320	UJ	320	320	UJ	320	320	UJ	320
2,4-Dinitrotoluene	SVOA	62	U	62	64	U	64	64	U	64	63	U	63
2,6-Dinitrotoluene	SVOA	26	U	26	27	U	27	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
2-Chlorophenol	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	47	U	47	48	U	48	49	U	49	48	U	48
2-Nitrophenol	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	32	U	32	32	U	32	32	U	32
3,3'-Dichlorobenzidine	SVOA	85	UJ	85	87	UJ	87	87	UJ	87	86	UJ	86
3-Nitroaniline	SVOA	69	U	69	70	U	70	71	U	71	70	U	70
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	320	U	320	320	U	320	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	62	U	62	64	U	64	64	U	64	63	U	63
4-Chloroaniline	SVOA	77	U	77	79	U	79	80	U	80	79	U	79
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
4-Nitroaniline	SVOA	68	U	68	70	U	70	70	U	70	70	U	70
4-Nitrophenol	SVOA	91	U	91	93	U	93	94	U	94	93	U	93
Acenaphthene	SVOA	9.7	U	9.7	9.9	U	9.9	10	U	10	9.9	U	9.9
Acenaphthylene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	25	U	25	25	U	25	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	38	U	38	39	U	39	39	U	39	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	22	U	22	22	U	22	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	22	U	22	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	43	U	43	44	U	44	45	U	45	44	U	44
Butylbenzylphthalate	SVOA	40	U	40	41	U	41	42	U	42	41	U	41
Carbazole	SVOA	34	U	34	35	U	35	35	U	35	35	U	35
Chrysene	SVOA	25	U	25	26	U	26	26	U	26	26	U	26
Di-n-butylphthalate	SVOA	27	U	27	28	U	28	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Diethyl phthalate	SVOA	24	U	24	25	U	25	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	22	U	22	22	U	22	22	U	22
Fluoranthene	SVOA	34	U	34	35	U	35	35	U	35	35	U	35
Fluorene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Hexachlorobenzene	SVOA	27	U	27	28	U	28	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	9.4	U	9.4	9.6	U	9.6	9.7	U	9.7	9.6	U	9.6
Hexachlorocyclopentadiene	SVOA	47	U	47	48	U	48	49	U	49	48	U	48
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Isophorone	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	30	U	30	30	U	30	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Naphthalene	SVOA	29	U	29	30	U	30	30	U	30	30	U	30
Nitrobenzene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	310	U	310	320	U	320	320	U	320	320	U	320
Phenanthrene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Phenol	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Pyrene	SVOA	11	U	11	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	10 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVX0, EXC-12			J1PVX7, SPA-6			J1PW04, Duplicate of J1PVX7			J1PVX2, SPA-1		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	26	U	26	26	U	26	28	U	28	29	U	29
1,2-Dichlorobenzene	SVOA	20	U	20	21	U	21	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	11	U	11	11	U	11	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	12	U	12	13	U	13	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	61	U	61	62	U	62	66	U	66	67	U	67
2,4-Dinitrophenol	SVOA	310	UJ	310	310	U	310	340	U	340	340	U	340
2,4-Dinitrotoluene	SVOA	61	U	61	62	U	62	66	U	66	67	U	67
2,6-Dinitrotoluene	SVOA	26	U	26	26	U	26	28	U	28	29	U	29
2-Chloronaphthalene	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
2-Chlorophenol	SVOA	19	U	19	20	U	20	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	17	U	17	18	U	18	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	13	U	13	13	U	13
2-Nitroaniline	SVOA	46	U	46	47	U	47	50	U	50	51	U	51
2-Nitrophenol	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
3+4 Methylphenol (cresol, m+p)	SVOA	30	U	30	31	U	31	33	U	33	34	U	34
3,3'-Dichlorobenzidine	SVOA	83	UJ	83	85	U	85	91	U	91	92	U	92
3-Nitroaniline	SVOA	67	U	67	69	U	69	73	U	73	75	U	75
4,6-Dinitro-2-methylphenol	SVOA	300	U	300	310	U	310	330	U	330	340	U	340
4-Bromophenylphenyl ether	SVOA	17	U	17	18	U	18	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	61	U	61	62	U	62	66	U	66	67	U	67
4-Chloroaniline	SVOA	75	U	75	77	U	77	82	U	82	84	U	84
4-Chlorophenylphenyl ether	SVOA	19	U	19	20	U	20	21	U	21	21	U	21
4-Nitroaniline	SVOA	66	U	66	68	U	68	73	U	73	74	U	74
4-Nitrophenol	SVOA	89	U	89	91	U	91	98	U	98	99	U	99
Acenaphthene	SVOA	9.4	U	9.4	9.7	U	9.7	10	U	10	11	U	11
Acenaphthylene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17
Anthracene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	18	U	18	19	U	19	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	18	U	18	19	UX	19	20	UX	20	20	UX	20
Benzo(b)fluoranthene	SVOA	24	U	24	25	U	25	26	U	26	27	U	27
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	37	U	37	38	U	38	40	U	40	41	U	41
Bis(2-chloro-1-methylethyl)ether	SVOA	21	U	21	22	U	22	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	21	U	21	22	U	22	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	15	U	15	16	U	16	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	42	U	42	43	U	43	46	U	46	47	U	47
Butylbenzylphthalate	SVOA	39	U	39	41	U	41	43	U	43	44	U	44
Carbazole	SVOA	33	U	33	34	U	34	36	U	36	37	U	37
Chrysene	SVOA	25	U	25	25	U	25	27	U	27	28	U	28
Di-n-butylphthalate	SVOA	27	U	27	27	U	27	29	U	29	30	U	30
Di-n-octylphthalate	SVOA	13	U	13	14	U	14	14	U	14	15	U	15
Dibenz[a,h]anthracene	SVOA	17	U	17	18	U	18	19	U	19	19	U	19
Dibenzofuran	SVOA	18	U	18	19	U	19	20	U	20	20	U	20
Diethyl phthalate	SVOA	24	U	24	24	U	24	26	U	26	27	U	27
Dimethyl phthalate	SVOA	21	U	21	22	U	22	23	U	23	23	U	23
Fluoranthene	SVOA	33	U	33	34	U	34	36	U	36	37	U	37
Fluorene	SVOA	17	U	17	17	U	17	18	U	18	18	U	18
Hexachlorobenzene	SVOA	27	U	27	27	U	27	29	U	29	30	U	30
Hexachlorobutadiene	SVOA	9.2	U	9.2	9.4	U	9.4	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	46	U	46	47	U	47	50	U	50	51	U	51
Hexachloroethane	SVOA	20	U	20	20	U	20	21	U	21	22	U	22
Indeno(1,2,3-cd)pyrene	SVOA	20	U	20	21	UX	21	22	UX	22	22	UX	22
Isophorone	SVOA	16	U	16	16	U	16	17	U	17	17	U	17
N-Nitroso-di-n-dipropylamine	SVOA	28	U	28	29	U	29	31	U	31	32	U	32
N-Nitrosodiphenylamine	SVOA	19	U	19	20	U	20	21	U	21	21	U	21
Naphthalene	SVOA	28	U	28	29	U	29	31	U	31	32	U	32
Nitrobenzene	SVOA	20	U	20	21	U	21	22	U	22	22	U	22
Pentachlorophenol	SVOA	300	U	300	310	U	310	330	U	330	340	U	340
Phenanthrene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17
Phenol	SVOA	17	U	17	17	U	17	18	U	18	18	U	18
Pyrene	SVOA	11	U	11	11	U	11	12	U	12	12	U	12

Attachment	1	Sheet No.	11 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVX3, SPA-2			J1PVX4, SPA-3			J1PVX5, SPA-4			J1PVX6, SPA-5		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
2,4,6-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
2,4-Dichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
2,4-Dimethylphenol	SVOA	66	U	66	64	U	64	65	U	65	66	U	66
2,4-Dinitrophenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330
2,4-Dinitrotoluene	SVOA	66	U	66	64	U	64	65	U	65	66	U	66
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
2-Chlorophenol	SVOA	21	U	21	20	U	20	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	49	U	49	49	U	49	50	U	50
2-Nitrophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	33	U	33	33	U	33
3,3'-Dichlorobenzidine	SVOA	89	U	89	88	U	88	89	U	89	90	U	90
3-Nitroaniline	SVOA	73	U	73	71	U	71	72	U	72	73	U	73
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	66	U	66	64	U	64	65	U	65	66	U	66
4-Chloroaniline	SVOA	81	U	81	80	U	80	81	U	81	82	U	82
4-Chlorophenylphenyl ether	SVOA	21	U	21	20	U	20	21	U	21	21	U	21
4-Nitroaniline	SVOA	72	U	72	71	U	71	72	U	72	72	U	72
4-Nitrophenol	SVOA	96	U	96	95	U	95	96	U	96	97	U	97
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	UX	20	20	UX	20	20	UX	20	20	UX	20
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	39	U	39	40	U	40	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	22	U	22	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	22	U	22	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	17	U	17	16	U	16	16	U	16	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	45	U	45	45	U	45	46	U	46
Butylbenzylphthalate	SVOA	43	U	43	42	U	42	43	U	43	43	U	43
Carbazole	SVOA	36	U	36	35	U	35	36	U	36	36	U	36
Chrysene	SVOA	27	U	27	26	U	26	27	U	27	27	U	27
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA	26	U	26	25	U	25	26	U	26	26	U	26
Dimethyl phthalate	SVOA	23	U	23	22	U	22	23	U	23	23	U	23
Fluoranthene	SVOA	36	U	36	35	U	35	36	U	36	36	U	36
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10
Hexachlorocyclopentadiene	SVOA	50	U	50	49	U	49	49	U	49	50	U	50
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	UX	22	21	UX	21	22	UX	22	22	UX	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	31	U	31	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	20	U	20	21	U	21	21	U	21
Naphthalene	SVOA	31	U	31	30	U	30	31	U	31	31	U	31
Nitrobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22
Pentachlorophenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	12 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PVX8, SPA-7			J1PVX9, SPA-8			J1PW00, SPA-10			J1PW01, SPA-11		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
2,4,6-Trichlorophenol	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
2,4-Dichlorophenol	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
2,4-Dimethylphenol	SVOA	66	U	66	65	U	65	66	U	66	64	U	64
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320
2,4-Dinitrotoluene	SVOA	66	U	66	65	U	65	66	U	66	64	U	64
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	49	U	49	50	U	50	48	U	48
2-Nitrophenol	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	33	U	33	33	U	33	32	U	32
3,3'-Dichlorobenzidine	SVOA	91	U	91	89	U	89	91	U	91	87	U	87
3-Nitroaniline	SVOA	73	U	73	72	U	72	73	U	73	70	U	70
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	66	U	66	65	U	65	66	U	66	64	U	64
4-Chloroaniline	SVOA	82	U	82	81	U	81	82	U	82	79	U	79
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
4-Nitroaniline	SVOA	73	U	73	72	U	72	73	U	73	70	U	70
4-Nitrophenol	SVOA	98	U	98	96	U	96	98	U	98	94	U	94
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	9.9	U	9.9
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	20	UX	20	20	UX	20	20	UX	20	19	UX	19
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	40	U	40	40	U	40	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	16	U	16	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	45	U	45	46	U	46	44	U	44
Butylbenzylphthalate	SVOA	43	U	43	43	U	43	43	U	43	41	U	41
Carbazole	SVOA	36	U	36	36	U	36	36	U	36	35	U	35
Chrysene	SVOA	27	U	27	27	U	27	27	U	27	26	U	26
Di-n-butylphthalate	SVOA	29	U	29	29	U	29	29	U	29	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	19	U	19
Diethyl phthalate	SVOA	26	U	26	26	U	26	26	U	26	25	U	25
Dimethyl phthalate	SVOA	23	U	23	23	U	23	23	U	23	22	U	22
Fluoranthene	SVOA	36	U	36	36	U	36	36	U	36	35	U	35
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	29	U	29	29	U	29	29	U	29	28	U	28
Hexachlorobutadiene	SVOA	10	U	10	9.9	U	9.9	10	U	10	9.6	U	9.6
Hexachlorocyclopentadiene	SVOA	50	U	50	49	U	49	50	U	50	48	U	48
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	UX	22	22	UX	22	22	UX	22	21	UX	21
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	31	U	31	31	U	31	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	20	U	20
Naphthalene	SVOA	31	U	31	31	U	31	31	U	31	30	U	30
Nitrobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21
Pentachlorophenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16
Phenol	SVOA	18	U	18	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	13 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1PW02, SPA-11			J1PW03, SPA-12			J1PW05, Equipment Blank		
		7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	29	U	29	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	23	U	23	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	13	U	13	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7
2,4-Dimethylphenol	SVOA	69	U	69	67	U	67	64	U	64
2,4-Dinitrophenol	SVOA	350	U	350	340	UX	340	320	U	320
2,4-Dinitrotoluene	SVOA	69	U	69	67	UX	67	64	U	64
2,6-Dinitrotoluene	SVOA	29	U	29	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	9.7	U	9.7
2-Chlorophenol	SVOA	22	U	22	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	20	U	20	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	14	U	14	13	U	13	13	U	13
2-Nitroaniline	SVOA	52	U	52	50	U	50	48	U	48
2-Nitrophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7
3+4 Methylphenol (cresol, m+p)	SVOA	35	U	35	33	U	33	32	U	32
3,3'-Dichlorobenzidine	SVOA	94	U	94	91	U	91	87	U	87
3-Nitroaniline	SVOA	76	U	76	74	U	74	71	U	71
4,6-Dinitro-2-methylphenol	SVOA	350	U	350	330	UX	330	320	U	320
4-Bromophenylphenyl ether	SVOA	20	U	20	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	69	U	69	67	U	67	64	U	64
4-Chloroaniline	SVOA	86	U	86	83	U	83	79	U	79
4-Chlorophenylphenyl ether	SVOA	22	U	22	21	UX	21	20	U	20
4-Nitroaniline	SVOA	76	U	76	73	UX	73	70	U	70
4-Nitrophenol	SVOA	100	U	100	98	U	98	94	U	94
Acenaphthene	SVOA	11	U	11	10	U	10	10	U	10
Acenaphthylene	SVOA	18	U	18	17	U	17	16	U	16
Anthracene	SVOA	18	U	18	17	UX	17	16	U	16
Benzo(a)anthracene	SVOA	21	U	21	20	UX	20	19	U	19
Benzo(a)pyrene	SVOA	21	UX	21	20	UX	20	19	UX	19
Benzo(b)fluoranthene	SVOA	27	U	27	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	17	U	17	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	42	U	42	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	24	U	24	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	24	U	24	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	48	U	48	46	U	46	45	U	45
Butylbenzylphthalate	SVOA	45	U	45	43	UX	43	42	U	42
Carbazole	SVOA	38	U	38	36	U	36	35	U	35
Chrysene	SVOA	28	U	28	27	UX	27	26	U	26
Di-n-butylphthalate	SVOA	30	U	30	29	UX	29	28	U	28
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	14	U	14
Dibenz[a,h]anthracene	SVOA	20	U	20	19	UX	19	18	U	18
Dibenzofuran	SVOA	21	U	21	20	U	20	19	U	19
Diethyl phthalate	SVOA	27	U	27	26	UX	26	25	U	25
Dimethyl phthalate	SVOA	24	U	24	23	UX	23	22	U	22
Fluoranthene	SVOA	38	U	38	36	UX	36	35	U	35
Fluorene	SVOA	19	U	19	18	UX	18	17	U	17
Hexachlorobenzene	SVOA	30	U	30	29	U	29	28	U	28
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	9.7	U	9.7
Hexachlorocyclopentadiene	SVOA	52	U	52	50	U	50	48	U	48
Hexachloroethane	SVOA	22	U	22	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	23	UX	23	22	UX	22	21	UX	21
Isophorone	SVOA	18	U	18	17	U	17	16	U	16
N-Nitroso-di-n-dipropylamine	SVOA	32	U	32	31	U	31	30	U	30
N-Nitrosodiphenylamine	SVOA	22	U	22	21	U	21	20	U	20
Naphthalene	SVOA	32	U	32	31	U	31	30	U	30
Nitrobenzene	SVOA	23	U	23	22	U	22	21	U	21
Pentachlorophenol	SVOA	350	U	350	330	U	330	320	U	320
Phenanthrene	SVOA	18	U	18	17	UX	17	16	U	16
Phenol	SVOA	19	U	19	18	U	18	17	U	17
Pyrene	SVOA	13	U	13	12	UX	12	12	U	12

Attachment	1	Sheet No.	14 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1PVW5, EXC-7			J1PVX1, Duplicate of J1PVW5			J1PVV9, EXC-1			J1PVW0, EXC-2		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB	8.1	U	8.1	8.0	U	8.0	8.2	U	8.2	8.1	U	8.1
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.26	U	0.26
Alpha-BHC	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.33	U	0.33	0.32	U	0.32	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.66	U	0.66	0.67	U	0.67	0.66	U	0.66	0.68	U	0.68
Delta-BHC	PEST	0.40	U	0.40	0.40	U	0.40	0.40	U	0.40	0.41	U	0.41
4,4'-DDD	PEST	0.54	U	0.54	0.55	U	0.55	0.54	U	0.54	0.56	U	0.56
4,4'-DDE	PEST	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
4,4'-DDT	PEST	0.58	U	0.58	0.60	U	0.60	0.59	U	0.59	0.61	U	0.61
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22
Endosulfan I	PEST	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17	0.18	U	0.18
Endosulfan II	PEST	0.28	UJ	0.28	0.29	UJ	0.29	0.28	UJ	0.28	0.29	UJ	0.29
Endosulfan sulfate	PEST	0.27	UJ	0.27	0.28	UJ	0.28	0.27	UJ	0.27	0.28	UJ	0.28
Endrin	PEST	0.30	U	0.30	0.31	U	0.31	0.30	U	0.30	0.31	U	0.31
Endrin aldehyde	PEST	0.17	UJ	0.17	0.17	UJ	0.17	0.17	UJ	0.17	0.18	UJ	0.18
Endrin ketone	PEST	0.48	UJ	0.48	0.49	UJ	0.49	0.48	UJ	0.48	0.50	UJ	0.5
Gamma-BHC (Lindane)	PEST	0.46	U	0.46	0.47	U	0.47	0.46	U	0.46	0.48	U	0.48
gamma-Chlordane	PEST	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27
Heptachlor	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22
Heptachlor epoxide	PEST	0.42	U	0.42	0.43	U	0.43	0.42	U	0.42	0.44	U	0.44
Methoxychlor	PEST	0.45	UJ	0.45	0.45	UJ	0.45	0.45	UJ	0.45	0.46	UJ	0.46
Toxaphene	PEST	16	UJ	16	16	UJ	16	16	UJ	16	16	UJ	16

CONSTITUENT	CLASS	J1PVW1, EXC-3			J1PVW2, EXC-4			J1PVW3, EXC-5			J1PVW4, EXC-6		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.7	U	2.7	2.8	U	2.8	2.9	U	2.9	2.7	U	2.7
Aroclor-1221	PCB	7.8	U	7.8	8.2	U	8.2	8.3	U	8.3	7.9	U	7.9
Aroclor-1232	PCB	1.9	U	1.9	2.0	U	2.0	2.1	U	2.1	2.0	U	2.0
Aroclor-1242	PCB	4.5	U	4.5	4.8	U	4.8	4.8	U	4.8	4.6	U	4.6
Aroclor-1248	PCB	4.5	U	4.5	4.8	U	4.8	4.8	U	4.8	4.6	U	4.6
Aroclor-1254	PCB	2.5	U	2.5	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6
Aroclor-1260	PCB	2.5	U	2.5	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6
Aldrin	PEST	0.24	U	0.24	0.26	U	0.26	0.26	U	0.26	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.22	U	0.22	0.22	U	0.22	0.20	U	0.20
alpha-Chlordane	PEST	0.31	U	0.31	0.33	U	0.33	0.34	U	0.34	0.31	U	0.31
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.64	U	0.64	0.69	U	0.69	0.69	U	0.69	0.64	U	0.64
Delta-BHC	PEST	0.39	U	0.39	0.42	U	0.42	0.42	U	0.42	0.38	U	0.38
4,4'-DDD	PEST	0.53	U	0.53	0.57	U	0.57	0.57	U	0.57	0.52	U	0.52
4,4'-DDE	PEST	0.23	U	0.23	0.25	U	0.25	0.25	U	0.25	0.23	U	0.23
4,4'-DDT	PEST	0.57	U	0.57	0.61	U	0.61	0.61	U	0.61	0.56	U	0.56
Dieldrin	PEST	0.20	U	0.20	0.22	U	0.22	0.22	U	0.22	0.20	U	0.20
Endosulfan I	PEST	0.17	U	0.17	0.18	U	0.18	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.28	UJ	0.28	0.30	UJ	0.30	0.30	UJ	0.30	0.27	UNJ	0.27
Endosulfan sulfate	PEST	0.27	UJ	0.27	0.29	UJ	0.29	0.29	UJ	0.29	0.26	UNJ	0.26
Endrin	PEST	0.30	U	0.30	0.32	U	0.32	0.32	U	0.32	0.29	U	0.29
Endrin aldehyde	PEST	0.17	UJ	0.17	0.18	UJ	0.18	0.18	UJ	0.18	0.16	UJ	0.16
Endrin ketone	PEST	0.47	UJ	0.47	0.51	UJ	0.51	0.51	UJ	0.51	0.47	UJ	0.47
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.48	U	0.48	0.48	U	0.48	0.44	U	0.44
gamma-Chlordane	PEST	0.26	U	0.26	0.28	U	0.28	0.28	U	0.28	0.25	U	0.25
Heptachlor	PEST	0.21	U	0.21	0.22	U	0.22	0.22	U	0.22	0.20	U	0.20
Heptachlor epoxide	PEST	0.41	U	0.41	0.44	U	0.44	0.44	U	0.44	0.41	U	0.41
Methoxychlor	PEST	0.44	UJ	0.44	0.47	UJ	0.47	0.47	UJ	0.47	0.43	UNJ	0.43
Toxaphene	PEST	15	UJ	15	16	UJ	16	16	UJ	16	15	UJ	15

Attachment	1	Sheet No.	15 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1PVW6, EXC-8			J1PVW7, EXC-9			J1PVW8, EXC-10			J1PVW9, EXC-11		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.7	U	2.7	2.9	U	2.9	2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB	7.8	U	7.8	8.3	U	8.3	8.1	U	8.1	8.2	U	8.2
Aroclor-1232	PCB	1.9	U	1.9	2.1	U	2.1	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.5	U	4.5	4.8	U	4.8	4.7	U	4.7	4.8	U	4.8
Aroclor-1248	PCB	4.5	U	4.5	4.8	U	4.8	4.7	U	4.7	4.8	U	4.8
Aroclor-1254	PCB	2.5	U	2.5	2.7	U	2.7	2.6	U	2.6	2.7	U	2.7
Aroclor-1260	PCB	2.5	U	2.5	2.7	U	2.7	2.6	U	2.6	2.7	U	2.7
Aldrin	PEST	0.25	U	0.25	0.26	U	0.26	0.24	U	0.24	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.33	U	0.33	0.31	U	0.31	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.66	U	0.66	0.68	U	0.68	0.64	U	0.64	0.67	U	0.67
Delta-BHC	PEST	0.40	U	0.40	0.41	U	0.41	0.39	U	0.39	0.41	U	0.41
4,4'-DDD	PEST	0.55	U	0.55	0.56	U	0.56	0.53	U	0.53	0.55	U	0.55
4,4'-DDE	PEST	0.24	U	0.24	0.25	U	0.25	0.23	U	0.23	0.24	U	0.24
4,4'-DDT	PEST	0.59	U	0.59	0.61	U	0.61	0.57	U	0.57	0.60	U	0.60
Dieldrin	PEST	0.21	U	0.21	0.22	U	0.22	0.20	U	0.20	0.21	U	0.21
Endosulfan I	PEST	0.18	U	0.18	0.18	U	0.18	0.17	U	0.17	0.18	U	0.18
Endosulfan II	PEST	0.29	UJ	0.29	0.30	UJ	0.30	0.28	UJ	0.28	0.29	UJ	0.29
Endosulfan sulfate	PEST	0.28	UJ	0.28	0.28	UJ	0.28	0.27	UJ	0.27	0.28	UJ	0.28
Endrin	PEST	0.31	U	0.31	0.32	U	0.32	0.30	U	0.30	0.31	U	0.31
Endrin aldehyde	PEST	0.17	UJ	0.17	0.18	UJ	0.18	0.17	UJ	0.17	0.17	UJ	0.17
Endrin ketone	PEST	0.49	UJ	0.49	0.50	UJ	0.50	0.47	UJ	0.47	0.49	UJ	0.49
Gamma-BHC (Lindane)	PEST	0.46	U	0.46	0.48	U	0.48	0.45	U	0.45	0.47	U	0.47
gamma-Chlordane	PEST	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27
Heptachlor	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22
Heptachlor epoxide	PEST	0.43	U	0.43	0.44	U	0.44	0.41	U	0.41	0.43	U	0.43
Methoxychlor	PEST	0.45	UJ	0.45	0.46	UJ	0.46	0.44	UJ	0.44	0.45	UJ	0.45
Toxaphene	PEST	16	UJ	16	16	UJ	16	15	UJ	15	16	UJ	16

CONSTITUENT	CLASS	J1PVX0, EXC-12			J1PVX7, SPA-6			J1PW04, Duplicate of J1PVX7			J1PVX2, SPA-1		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB	8.1	U	8.1	8.1	U	8.1	8.0	U	8.0	8.2	U	8.2
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8
Aroclor-1248	PCB	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7
Aldrin	PEST	0.25	U	0.25	0.24	U	0.24	0.25	U	0.25	0.26	U	0.26
Alpha-BHC	PEST	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.31	U	0.31	0.33	U	0.33	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.67	U	0.67	0.64	U	0.64	0.67	U	0.67	0.68	U	0.68
Delta-BHC	PEST	0.40	U	0.40	0.39	U	0.39	0.41	U	0.41	0.41	U	0.41
4,4'-DDD	PEST	0.55	U	0.55	0.53	U	0.53	0.55	U	0.55	0.56	U	0.56
4,4'-DDE	PEST	0.24	U	0.24	0.23	U	0.23	0.24	U	0.24	0.24	U	0.24
4,4'-DDT	PEST	0.59	U	0.59	0.57	U	0.57	0.60	U	0.60	0.60	U	0.60
Dieldrin	PEST	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.21	U	0.21
Endosulfan I	PEST	0.18	U	0.18	0.17	U	0.17	0.18	U	0.18	0.18	U	0.18
Endosulfan II	PEST	0.29	UJ	0.29	0.28	U	0.28	0.29	U	0.29	0.29	U	0.29
Endosulfan sulfate	PEST	0.28	UJ	0.28	0.27	U	0.27	0.28	U	0.28	0.28	U	0.28
Endrin	PEST	0.31	U	0.31	0.30	U	0.30	0.31	U	0.31	0.31	U	0.31
Endrin aldehyde	PEST	0.17	UJ	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.49	UJ	0.49	0.47	U	0.47	0.50	U	0.50	0.50	U	0.50
Gamma-BHC (Lindane)	PEST	0.47	U	0.47	0.45	U	0.45	0.47	U	0.47	0.47	U	0.47
gamma-Chlordane	PEST	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27	0.27	U	0.27
Heptachlor	PEST	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22	0.22	U	0.22
Heptachlor epoxide	PEST	0.43	U	0.43	0.41	U	0.41	0.43	U	0.43	0.43	U	0.43
Methoxychlor	PEST	0.45	UJ	0.45	0.44	U	0.44	0.46	U	0.46	0.46	U	0.46
Toxaphene	PEST	16	UJ	16	15	U	15	16	U	16	16	U	16

Attachment	1	Sheet No.	16 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1PVX3, SPA-2			J1PVX4, SPA-3			J1PVX5, SPA-4			J1PVX6, SPA-5		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.9	U	2.9	2.7	U	2.7
Aroclor-1221	PCB	8.2	U	8.2	8.0	U	8.0	8.3	U	8.3	7.9	U	7.9
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.1	U	2.1	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.8	U	4.8	4.6	U	4.6
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.8	U	4.8	4.6	U	4.6
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7	2.6	U	2.6
Aldrin	PEST	0.24	U	0.24	0.25	U	0.25	0.26	U	0.26	0.26	U	0.26
Alpha-BHC	PEST	0.20	U	0.20	0.22	U	0.22	0.23	U	0.23	0.22	U	0.22
alpha-Chlordane	PEST	0.30	U	0.30	0.33	U	0.33	0.34	U	0.34	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.63	U	0.63	0.67	U	0.67	0.70	U	0.70	0.68	U	0.68
Delta-BHC	PEST	0.38	U	0.38	0.40	U	0.40	0.42	U	0.42	0.41	U	0.41
4,4'-DDD	PEST	0.51	U	0.51	0.55	U	0.55	0.58	U	0.58	0.56	U	0.56
4,4'-DDE	PEST	0.22	U	0.22	0.24	U	0.24	0.25	U	0.25	0.25	U	0.25
4,4'-DDT	PEST	0.56	U	0.56	0.59	U	0.59	0.62	U	0.62	0.61	U	0.61
Dieldrin	PEST	0.20	U	0.20	0.21	U	0.21	0.22	U	0.22	0.22	U	0.22
Endosulfan I	PEST	0.17	U	0.17	0.18	U	0.18	0.19	U	0.19	0.18	U	0.18
Endosulfan II	PEST	0.27	U	0.27	0.29	U	0.29	0.30	U	0.30	0.30	U	0.30
Endosulfan sulfate	PEST	0.26	U	0.26	0.28	U	0.28	0.29	U	0.29	0.28	U	0.28
Endrin	PEST	0.29	U	0.29	0.31	U	0.31	0.32	U	0.32	0.32	U	0.32
Endrin aldehyde	PEST	0.16	U	0.16	0.17	U	0.17	0.18	U	0.18	0.18	U	0.18
Endrin ketone	PEST	0.46	U	0.46	0.49	U	0.49	0.52	U	0.52	0.5	U	0.50
Gamma-BHC (Lindane)	PEST	0.44	U	0.44	0.47	U	0.47	0.49	U	0.49	0.48	U	0.48
gamma-Chlordane	PEST	0.25	U	0.25	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27
Heptachlor	PEST	0.20	U	0.20	0.22	U	0.22	0.23	U	0.23	0.22	U	0.22
Heptachlor epoxide	PEST	0.40	U	0.40	0.43	U	0.43	0.45	U	0.45	0.44	U	0.44
Methoxychlor	PEST	0.42	U	0.42	0.45	U	0.45	0.47	U	0.47	0.46	U	0.46
Toxaphene	PEST	15	U	15	16	U	16	17	U	17	16	U	16

CONSTITUENT	CLASS	J1PVX8, SPA-7			J1PVX9, SPA-8			J1PW00, SPA-10			J1PW01, SPA-11		
		7/17/2012			7/17/2012			7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.9	U	2.9	2.8	U	2.8	2.8	U	2.8	2.9	U	2.9
Aroclor-1221	PCB	8.3	U	8.3	8.1	U	8.1	8.1	U	8.1	8.3	U	8.3
Aroclor-1232	PCB	2.1	U	2.1	2.0	U	2.0	2.0	U	2.0	2.1	U	2.1
Aroclor-1242	PCB	4.8	U	4.8	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8
Aroclor-1248	PCB	4.8	U	4.8	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8
Aroclor-1254	PCB	2.7	U	2.7	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7
Aroclor-1260	PCB	2.7	U	2.7	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.65	U	0.65	0.66	U	0.66	0.67	U	0.67	0.67	U	0.67
Delta-BHC	PEST	0.39	U	0.39	0.40	U	0.40	0.40	U	0.40	0.41	U	0.41
4,4'-DDD	PEST	0.54	U	0.54	0.55	U	0.55	0.55	U	0.55	0.55	U	0.55
4,4'-DDE	PEST	0.23	U	0.23	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24
4,4'-DDT	PEST	0.58	U	0.58	0.59	U	0.59	0.59	U	0.59	0.60	U	0.60
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21
Endosulfan I	PEST	0.17	U	0.17	0.18	U	0.18	0.18	U	0.18	0.18	U	0.18
Endosulfan II	PEST	0.28	U	0.28	0.29	U	0.29	0.29	U	0.29	0.29	U	0.29
Endosulfan sulfate	PEST	0.27	U	0.27	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28
Endrin	PEST	0.30	U	0.30	0.31	U	0.31	0.31	U	0.31	0.31	U	0.31
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.48	U	0.48	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.46	U	0.46	0.47	U	0.47	0.47	U	0.47
gamma-Chlordane	PEST	0.26	U	0.26	0.27	U	0.27	0.27	U	0.27	0.27	U	0.27
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22
Heptachlor epoxide	PEST	0.42	U	0.42	0.43	U	0.43	0.43	U	0.43	0.43	U	0.43
Methoxychlor	PEST	0.44	U	0.44	0.45	U	0.45	0.45	U	0.45	0.45	U	0.45
Toxaphene	PEST	15	U	15	16	U	16	16	U	16	16	U	16

Attachment	1	Sheet No.	17 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1PW02, SPA-11			J1PW03, SPA-12		
		7/17/2012			7/17/2012		
		ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	2.9	U	2.9	2.8	U	2.8
Aroclor-1221	PCB	8.3	U	8.3	8.1	U	8.1
Aroclor-1232	PCB	2.1	U	2.1	2.0	U	2.0
Aroclor-1242	PCB	4.8	U	4.8	4.7	U	4.7
Aroclor-1248	PCB	4.8	U	4.8	4.7	U	4.7
Aroclor-1254	PCB	2.7	U	2.7	2.6	U	2.6
Aroclor-1260	PCB	2.7	U	2.7	2.6	U	2.6
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.33	U	0.33
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.67	U	0.67	0.67	U	0.67
Delta-BHC	PEST	0.40	U	0.40	0.41	U	0.41
4,4'-DDD	PEST	0.55	U	0.55	0.55	U	0.55
4,4'-DDE	PEST	0.24	U	0.24	0.24	U	0.24
4,4'-DDT	PEST	0.59	U	0.59	0.60	U	0.60
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21
Endosulfan I	PEST	0.18	U	0.18	0.18	U	0.18
Endosulfan II	PEST	0.29	U	0.29	0.29	U	0.29
Endosulfan sulfate	PEST	0.28	U	0.28	0.28	U	0.28
Endrin	PEST	0.31	U	0.31	0.31	U	0.31
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.49	U	0.49	0.50	U	0.50
Gamma-BHC (Lindane)	PEST	0.47	U	0.47	0.47	U	0.47
gamma-Chlordane	PEST	0.27	U	0.27	0.27	U	0.27
Heptachlor	PEST	0.21	U	0.21	0.22	U	0.22
Heptachlor epoxide	PEST	0.43	U	0.43	0.43	U	0.43
Methoxychlor	PEST	0.45	U	0.45	0.46	U	0.46
Toxaphene	PEST	16	U	16	16	U	16

Attachment	1	Sheet No.	18 of 18
Originator	N. K. Schiffern	Date	8/8/12
Checked	I. B. Berezovskiy	Date	8/8/12
Calc. No.	0100D-CA-V0464	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0465

Subject: 100-D-14 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	N. K. Schiffern N K Schiffern	I. B. Berezovskiy I B Berezovskiy	C. H. Dobier C H Dobier	D. F. Obenauer D. F. Obenauer	10/22/12

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:	N. K. Schiffern	Date:	08/07/12	Calc. No.:	0100D-CA-V0465	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	08/07/12
Subject:	100-D-14 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 100-D-14 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, 2009a, *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) DOE-RL, 2009b, 100 Area Remedial Action Sampling and Analysis Plan, DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

4) WCH, 2012, *100-D-14 Waste Site Cleanup Verification 95% UCL Calculation*, 0100D-CA-V0464, 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 2009a).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2009a).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	08/07/12	Calc. No.:	0100D-CA-V0465	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	08/07/12
Subject:	100-D-14 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The 100-D-14 waste site is comprised of two decision units for verification sampling. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-14 waste site were conservatively calculated for the entire waste site using the greater of the statistical or maximum value for each analyte in all decision units from WCH (2012). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, and molybdenum require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Selenium and nitrogen in nitrite require HQ and risk calculations because these analytes were detected above a Washington State or Hanford Site background value. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 1.6 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 2.2×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 7.3×10^{-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, then multiplied by 1.0×10^{-6}. For example, the maximum value for hexavalent chromium is 0.380 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 1.8×10^{-7}. 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 is obtained by summing the individual values. The excess cancer risk for the carcinogenic constituents detected 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:	N. K. Schiffern	Date:	08/07/12	Calc. No.:	0100D-CA-V0465	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	08/07/12
Subject:	100-D-14 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 100-D-14 Waste Site.

Contaminant of Potential Concern[a]	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	1.6	7,200	2.2E-04	--	--
Chromium, hexavalent[c]	0.380	240	1.6E-03	2.1	1.8E-07
Molybdenum	0.28	400	7.0E-04	--	--
Selenium	1.9	400	4.8E-03	--	--
Anions					
Nitrogen in Nitrite	0.50	8,000	6.3E-05	--	--
Totals					
Cumulative Hazard Quotient:			**7.3E-03**		
Cumulative Excess Cancer Risk:					**1.8E-07**

Note:

[a] = From WCH (2012).

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

-- = not applicable

RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-D-14 waste site meets the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The direct contact hazard quotients and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0467

Subject: 100-D-14 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater

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	N. K. Schiffern N. K. Schiffern	I. B. Berezovskiy I. B. Berezovskiy	J. D. Skoglie J. D. Skoglie	D. F. Obenauer D. F. Obenauer	10/22/12

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:	N. K. Schiffern	Date:	8/7/2012	Calc. No.:	0100D-CA-V0467	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	8/7/2012
Subject:	100-D-14 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 100-D-14 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) BHI, 2005, *100 Area Analogous Sites RESRAD Evaluation*, Calculation No. 0100X-CA-V0050 Rev 0, Bechtel Hanford, Inc., Richland, Washington.

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

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

4) WCH, 2012, *100-D-14 Waste Site Cleanup Verification 95% UCL Calculations*, 0100D-CA-V0464, Rev. 0, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern NS	Date:	10/17/2012	Calc. No.:	0100D-CA-V0467	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/17/2012
Subject:	100-D-14 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-D-14 waste site was divided into two decision units for the purpose of verification sampling; excavation and staging pile area. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-D-14 waste site were conservatively calculated for the entire waste site using the greater of the statistical or maximum value for each analyte in all decision units from the 95% UCL calculation (WCH 2012). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, and nitrogen in nitrite are included because no Washington State or Hanford background value has been established and the distribution coefficients are less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (BHI 2005). Based on this model and a vadose zone of approximately 24.3 m (79.7 ft) thickness, a K_d of 3.1 or greater is required to show no predicted migration to groundwater in 1,000 years. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 3.1. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (mg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720(3)(a)(ii)(A), 1996) x 100 x 1 mg/1000 mg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the statistical value for boron of 1.6 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 5.0×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The cumulative HQ for the 100-D-14 waste site is 8.7×10^{-2}. 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}. The 100-D-14 waste site doesn't have any constituents with carcinogen RAG, the criterion for excess cancer risk is met. Consequently, the criterion for cumulative excess cancer risk for carcinogens is also met.

4) The soil cleanup RAGs for protection of groundwater are based on the "100 times" provision in WAC 173-340-740(3)(a)(ii)(A). WAC 173-340-740(3)(a)(ii)(A) (1996) provides the "100 times rule" but also states "unless it can be demonstrated that a higher soil concentration is protective of ground water at the site." When the "100 times rule" values are exceeded, RESRAD was used to demonstrate that higher soil concentrations may be protective of groundwater.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	10/17/2012	Calc. No.:	0100D-CA-V0467	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/17/2012
Subject:	100-D-14 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 3 of 3	

RESULTS:

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

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-D-14 Waste Site.

Contaminants of Potential Concern[a]	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	1.6	320	5.0E-03	--	--
Chromium, hexavalent	0.380	4.8	7.9E-02	--	--
Anions					
Nitrogen in nitrite	0.50	160	3.1E-03	--	--
Totals					
Cumulative Hazard Quotient:			**8.7E-02**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:
[a] = From WCH (2012).
[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.
-- = not applicable
RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-D-14 waste site meets the requirements for the hazard quotients and excess carcinogenic risk for protection of groundwater as identified in the RDR/RAWP (DOE-RL 2009).

APPENDIX C

DATA QUALITY ASSESSMENT

APPENDIX C

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2012b). 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 2012b), the field logbooks (WCH 2012a), 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 procedures 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 100-D-14 waste site were provided by the laboratories in two sample delivery groups (SDGs): SDG JP0397 and SDG JP0398. SDG J00398 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed for the 100-D-14 waste site data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG JP0397

This SDG comprises 13 statistical soil samples (J1PVX2 through J1PVX9, J1PW00 through J1PW05) from the 100-D-14 waste site staging pile area. This SDG includes one field duplicate pair (J1PVX7/J1PW04). These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), pesticides, ion chromatography (IC) anions, nitrate/nitrite, hydrogen ion concentration (pH), and hexavalent chromium. In addition, one equipment blank (J1PW05) was collected and analyzed for ICP metals, and mercury and SVOCs. Minor deficiencies are as follows:

In the SVOC analysis, the laboratory control sample (LCS) recoveries for 4-chloroaniline and 3,3-dichlorobenzidine were below quality control (QC) limits at 49% and 40%, respectively. However, these analyte recoveries were within the laboratory QC limits. All 4-chloroaniline and 3,3-dichlorobenzidine analytical results in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the matrix spike (MS) recoveries for dibenz(a,h)anthracene and 4,6-dinitro-2-methylphenol were below the project QC limits, at 47% and 45%, respectively. However, the matrix spike duplicate (MSD) recoveries for dibenz(a,h)anthracene and 4,6-dinitro-2-methylphenol were within the QC limits. The MS and MSD recoveries for 2,4-dinitrophenol were below the quality control limits, at 32% and 36%, respectively. The analytical results for these SVOCs may be considered estimated due to the MS and/or MSD recoveries outside the QC limits. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the method blank (MB), at low levels, less than 1/25th of the most stringent cleanup limit. All zinc results in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS and MS recoveries for silicon are below the project recovery limits, at 17% and -18%, respectively. Silicon is not a contaminant of concern (COC) or contaminant of potential concern (COPC) for 100-D-14 waste site nor is it a regulated compound under the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup." All silicon results in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries are out of project acceptance criteria for five analytes (aluminum [1024%], antimony [49%], iron [720%], manganese [149%], and silicon [-18%]). For aluminum, iron and manganese analytes the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration rather than a measure of the recovery from the sample. Antimony and silicon did not have mismatched spike and native concentrations in the MS. All antimony and silicon results for SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the method 9056 IC anions analysis, due to the holding time being exceeded by less than twice the limit (48 hours) for nitrate, nitrite, and orthophosphate, all results for these analytes in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the laboratory duplicate RPD for nitrate and nitrite as nitrogen is above the acceptance criteria (30%), at 36%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control and method accuracy has been verified by the acceptable LCS analysis data. All nitrate and nitrite as nitrogen results in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, sulfate was detected in the MB, at low levels, less than 1/25th of the most stringent cleanup limit. All sulfate results in SDG JP0397 may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0398

This SDG comprises 13 statistical soil samples (J1PVV9, J1PVW0 through J1PVW9, J1PVX0 through J1PVX1) from the 100-D-14 waste site excavation. This SDG includes one field duplicate pair (J1PVW5/J1PVX1). These samples were analyzed for ICP metals, mercury, PCBs, SVOCs, pesticides, IC anions, nitrate/nitrite, pH, and hexavalent chromium. Samples were collected on July 17, 2012, and analyzed for IC anions, 9056 method on July 20, 2012. SDG JP0398 was submitted for third-party validation. Minor deficiencies are as follows:

In the ICP metals analysis, barium was detected in the MB, at low levels, less than 1/25th of the most stringent cleanup limit. All barium results in SDG JP0398 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS and MS recoveries for silicon were below the project recovery limits, at 20% and -0.07%, respectively. Silicon is not a COC or COPC for the 100-D-14 waste site, nor is it a regulated compound under WAC 173-340, "Model Toxics Control Act – Cleanup." All silicon results in SDG JP0398 were qualified as estimated, with "J" flags, by third-party validation. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for five analytes (aluminum [1294%], antimony [53%], calcium [131%], iron [1131%], and silicon [-0.07%]). For aluminum and iron analytes the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration rather than a measure of the recovery from the sample. Antimony, calcium, and silicon did not have mismatched spike and native concentrations in the MS. All antimony, calcium, and silicon results for SDG JP0398 were qualified as estimated, with "J" flags, by third-party validation. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the MSD recoveries for endosulfan II (48%), endosulfan sulfate (26%), and methoxychlor (9%) were below the QC limits. The MS recoveries for these analytes were within the acceptable QC limits. The analytical results for these pesticides were qualified as estimated, with "J" flags, by third-party validation. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the relative percent differences (RPDs) are outside the QC limits for endosulfan II (72%), endosulfan sulfate (117%), endrin aldehyde (53%), endrin ketone (35%), and methoxychlor (161%). The analytical results for these pesticides were qualified as estimated, with "J" flags, by third-party validation. Estimated data are usable for decision-making purposes.

In the pesticide analysis, toxaphene results were qualified as estimated with "J" flags, by third-party validation, due to the lack of MS, MSD, and LCS analysis. Estimated data are usable for decision-making purposes.

In the IC anions analysis, due to the holding time being exceeded by less than twice the limit (48 hours) for nitrate, nitrite, and orthophosphate results, third-party validation qualified the method 9056 IC anions, nitrate, nitrite, and orthophosphate results in SDG JP0398 as estimated, with "J" flags. The U.S. Environmental Protection Agency (EPA) analytical method 353.2 was also requested to provide acceptable nitrate/nitrite data for decision making purposes. Phosphate is not a regulated chemical under WAC 173-340, "Model Toxics Control Act – Cleanup." The estimated data for nitrate, nitrite, and orthophosphate analytes do not hinder the evaluation of the 100-D-14 waste site. Estimated data are usable for decision-making purposes.

In the IC anions analysis, due to MB contamination, sulfate results of similar concentration magnitude as the concentrations detected in MB were qualified as undetected, with "U" flags, by third-party validation. Specifically, the sulfate results for samples J1PVV9, J1PVW5, J1PVW6, J1PVW7, J1PVW8, J1PVW9, J1PVX0, and J1PVX1 were qualified as undetected. The data are usable for decision-making purposes.

In the pH analysis, due to the holding time being exceeded by greater than twice the limit (24 hours), all pH results were qualified as estimated, with "J" flags, by third-party validation. Estimated data are usable for decision-making purposes.

In the SVOCs analysis, the LCS recovery is below the QC limits for 3,3-dichlorobenzidine, at 49 %. The MS and MSD recoveries for 3,3-dichlorobenzidine were within the acceptable project QC limits. The MS and MSD recoveries for 2,4-dinitrophenol were below the QC limits, at 40% and 42%, respectively. All of the data for 3,3-dichlorobenzidine and 2,4-dinitrophenol in SDG JP0398 were qualified by third-party validation as estimated, with "J" flags. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field 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 2012a), are shown in Table C-1. The main and QA/QC sample results are presented in Appendix B.

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

Sample Area	Main Sample	Duplicate Sample
Excavation (EXC-7)	J1PVW5	J1PVX1
Staging pile area (SPA-6)	J1PVX7	J1PW04

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

None of the RPDs calculated for the field duplicate sample are above the acceptance criteria (30%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the TDL, including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. No sample results required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-D-14 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 100-D-14 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 project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The verification sample analytical data are also summarized in Appendix B.

REFERENCES

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

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

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

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

WCH, 2012a, *100-D Field Remediation and Sampling*, Logbook EL-1607-14, pp. 33-36, Washington Closure Hanford, Richland, Washington.

WCH, 2012b, *Work Instruction for Verification Sampling of the 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 Waste Site,* 0100D-WI-G0119, Rev. 0, Washington Closure Hanford, Richland, Washington.