WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2015-019

Waste Site Code(s)/Subsite Code(s): 100-D-86:1

Reclassification Category: Interim ☒ Final ☐

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

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-86:1, 105-D Gas Recirculation Pipelines subsite, part of the 100-DR-1 Operable Unit, was added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999) via the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2009). The 100-D-86:1 subsite was recommended for remedial action without confirmatory sampling.

Remedial action at the 100-D-86:1 subsite was performed between March 24 and August 5, 2014. The remediation extended to an approximate maximum depth of 7 m (23 ft) below ground surface, resulting in approximately 3,202 bank cubic meters (BCM) (4,188 bank cubic yards [BCY]) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility (ERDF). The debris consisted of steel pipe, concrete, and rebar. All material was direct loaded from the excavation for disposal at the ERDF; therefore, no waste staging pile area was generated. Approximately 2,946 BCM (3,853 BCY) of overburden material was salvaged from the 100-D-86:1 subsite and stockpiled for use as clean backfill material.

Verification sampling was conducted on January 6 and 7, 2015. The sampling was performed to determine if the waste site met the remedial action objectives and remedial action goals established by the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-97-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009b), and the Remaining Sites ROD (EPA 1999). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

The verification sampling and modeling results for the 100-D-86:1 subsite demonstrate that the site meets the remedial action objectives and corresponding remedial action goals established in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999) to support a reclassification to Interim Closed Out. These sampling and modeling results established that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-86:1, 105-D Gas Recirculation Pipelines Subsite* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2015-019

Waste Site Code(s)/Subsite Code(s): 100-D-86:1

Regulator comments:

Waste Site Controls:

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

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

J. P. Neath	J P Neath	6/3/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	6/4/15
Ecology Project Manager (printed)	Signature	Date
NA		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-86:1, 105-D GAS RECIRCULATION PIPELINES SUBSITE

Attachment to Waste Site Reclassification Form 2015-019

June 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-86:1, 105-D GAS RECIRCULATION PIPELINES SUBSITE

EXECUTIVE SUMMARY

The 100-D-86:1, 105-D Gas Recirculation Pipelines subsite, part of the 100-DR-1 Operable Unit, is part of the 100-D-86, Process Sewer pipelines waste site. The 100-D-86 waste site was added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999) via the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009). The 100-D-86:1 subsite was recommended for remedial action without confirmatory sampling (WCH 2010).

Remedial action at the 100-D-86:1 subsite was performed between March 24 and August 5, 2014. The remediation extended to an approximate maximum depth of 7 m (23 ft) below ground surface, resulting in approximately 3,202 bank cubic meters (BCM) (4,188 bank cubic yards [BCY]) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility. The debris consisted of steel pipe, concrete, and rebar. All material was direct loaded from the excavation for disposal at the Environmental Restoration Disposal Facility; therefore, no waste staging pile area was generated. Approximately 2,946 BCM (3,853 BCY) of overburden material was salvaged from the 100-D-86:1 subsite and stockpiled for use as clean backfill material. No stained soil or anomalous materials were encountered during the remediation.

Verification sampling was conducted on January 6 and 7, 2015. A summary of the cleanup evaluation for the soil sampling results against the applicable remedial action goals is presented in Table ES-1. The results of the verification sampling were used to make reclassification decisions for the 100-D-86:1 subsite in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

In accordance with this evaluation, the verification sampling results and modeling support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The sampling and modeling results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required.

Table ES-1. Summary of Remedial Action Goals for the 100-D-86:1 Subsite. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain a dose rate of <15 mrem/yr above background over 1,000 years.	The maximum predicted cumulative dose rate for the 100-D-86:1 subsite is 1.26 mrem/yr at the shallow zone decision unit, which is <15 mrem/yr.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC direct exposure 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 the 100-D-86:1 subsite (5.5×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for individual carcinogens is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk (1.3×10^{-6}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	All individual radionuclide COPC concentrations are below the groundwater/river protection soil lookup values.	Yes
	Attain National Primary Drinking Water Regulations [a]: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ.	All individual radionuclide COPC concentrations are below the groundwater/river protection soil lookup values.	
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].	No non-uranium alpha-emitting radionuclide COPC concentrations were quantified above groundwater/river protection lookup values.	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L) [c].	The total uranium assay was not quantified above background levels for this site.	

Table ES-1. Summary of Remedial Action Goals for the 100-D-86:1 Subsite. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs exceeded soil RAGs for groundwater and/or river protection. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), it is predicted that the residual concentrations of the contaminants will not reach groundwater (and thus 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 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 100 Area RDR/RAWP (DOE-RL 2009b), residual concentrations of vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs are predicted to migrate less than 1 m (3.3 ft) vertically in 1,000 years (based on the lowest distribution coefficient (K_d) of these contaminants [aroclor-1254 with a K_d of 75.6 mL/g]). The vadose zone underlying the 100-D-86:1 waste site is approximately 18 m (59 ft) thick. Therefore, residual concentrations of vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
NA = not applicable
PCB = polychlorinated biphenyl
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-86:1 subsite contaminants of potential concern and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, mercury, and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of manganese, mercury, and zinc are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-86:1, 105-D GAS RECIRCULATION PIPELINES SUBSITE

STATEMENT OF PROTECTIVENESS

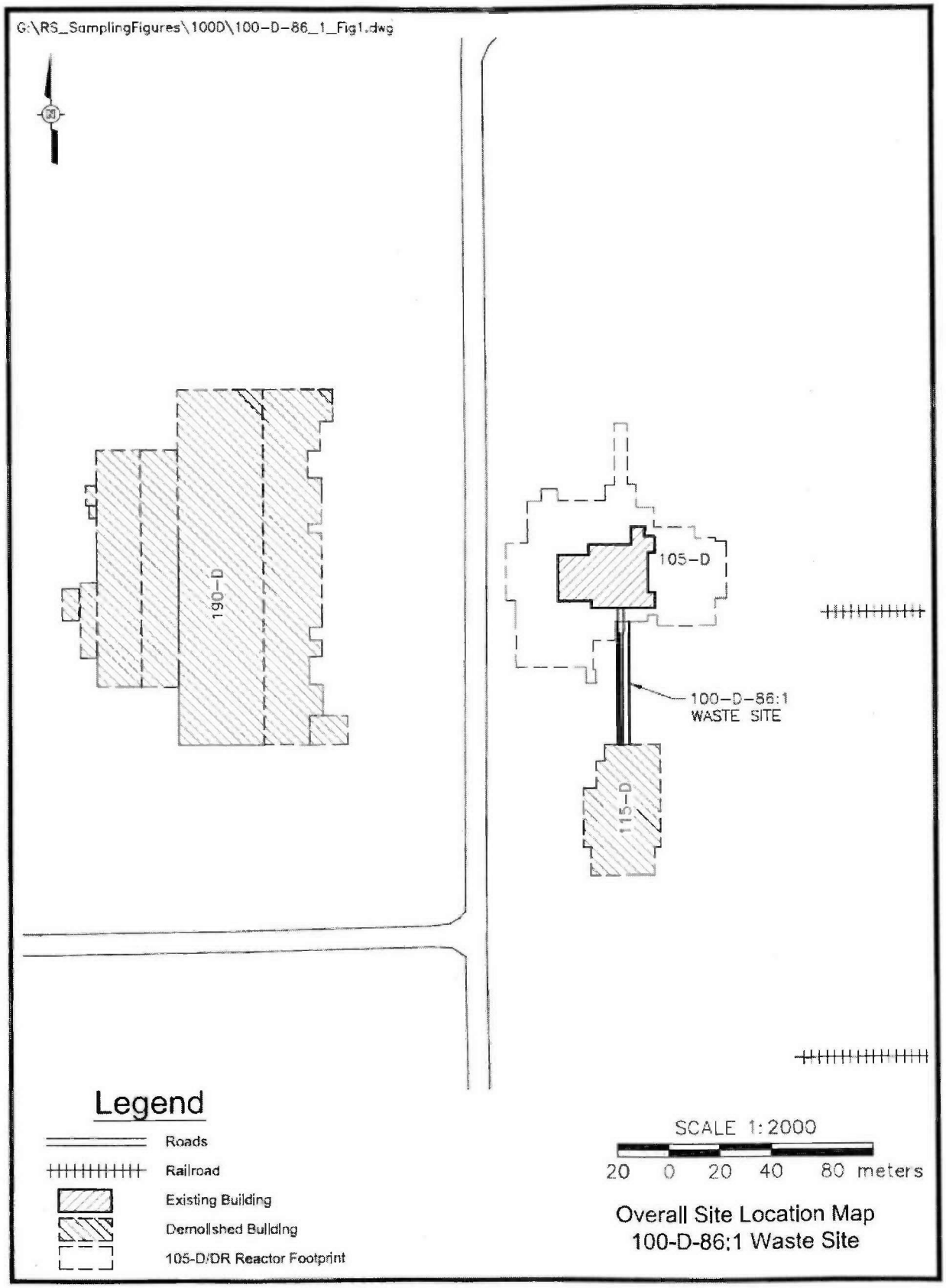
The 100-D-86:1 subsite cleanup verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units* (Remaining Sites ROD) (EPA 1999). The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-86:1 subsite contaminants of potential concern (COPCs) and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, mercury, and vanadium. The U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of manganese, mercury, and zinc are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-86:1, 105-D Gas Recirculation Pipelines subsite, located within the 100-DR-1 Operable Unit, is part of the 100-D-86, Process Sewer Pipelines waste site. The 100-D-86:1 subsite consisted of two 41-cm (16-in.)-diameter steel gas recirculation pipelines between the former 115-D/DR Gas Recirculation Facility and the 105-D Reactor (Figure 1). The gas recirculation pipelines were part of the system that was used to remove radioactive particulates and water from the reactor cover gases. The pipelines were used for the recirculation of helium and carbon dioxide cover gases between the 105-D Reactor Building and the filters and driers in the 115-D/DR Gas Recirculation Facility.

Figure 1. 100-D-86:1 Pipeline Subsite Overall Site Location Map.



The 115-D Facility was constructed in 1943 and was operated until 1967. The pipe tunnel was demolished in situ in 1986. The adjoining tunnels were decommissioned by UNC Nuclear Industries in 1985 and 1986. The tunnel piping and valves were not removed.

Characterization of analogous pipelines in the gas recirculation wing of the 105-H Reactor revealed the accumulation of soil sludge containing multiple radionuclides at levels above remedial action goals (RAGs). Consequently the two 41-cm (16 in.)-diameter circulation lines between the 115-D and 105-D Buildings were added to the 100-D-86 waste site on October 19, 2008. The 100-D-86 waste site encompassed 32 process sewer pipelines across the 100-D Area. The 100-D-86 waste site was divided into three subsites (100-D-86:1, 100-D-86:2, and 100-D-86:3) for closure. The 100-D-86:1 subsite was recommended for cleanup by remove, treat, and dispose in May 2010 (WCH 2010).

REMEDIAL ACTION SUMMARY

The 100-D-86:1 subsite was remediated between March 24 and August 5, 2014. The remediation extended to an approximate maximum depth of 7 m (23 ft) below ground surface (bgs), resulting in approximately 3,202 bank cubic meters (BCM) (4,188 bank cubic yards [BCY]) of contaminated soil and debris being removed for disposal at the Environmental Restoration Disposal Facility. The debris included steel pipe, concrete, and rebar. All material was direct loaded from the excavation for disposal at the Environmental Restoration Disposal Facility; therefore, no waste staging pile area was generated.

Approximately 2,946 BCM (3853 BCY) of overburden material was salvaged from the 100-D-86:1 subsite excavation and stockpiled for use as clean backfill.

A Global Positioning Environmental Radiological Surveyor (GPERS) survey of the overburden pile, conducted in March 2014, detected a radiological hot spot above background. The hot spot was excavated on September 24, 2014, and new GPERS surveys were conducted on the overburden pile in November 2014. No elevated activity above background was detected. A GPERS survey of the excavation was conducted following site remediation. The survey results indicated gamma detections above background levels in the deep zone of the excavation, localized to a small area near the 105-D Reactor wall. Due to the proximity of the radiological activity to the reactor, no additional soil was removed. The beta and gamma radiological track maps are provided in Appendix B.

A post-remediation civil survey of the 100-D-86:1 excavation overlaid on the waste site boundary is provided in Figure 2. Figure 3 shows the 100-D-86:1 subsite post-excavation shallow and deep zones and the overburden soil stockpile boundaries. Post-remediation photographs are provided in Figures 4 and 5.

No in-process soil samples were collected from the 100-D-86:1 subsite.

Figure 2. 100-D-86:1 Pipeline Subsite Post-Remediation Civil Survey.

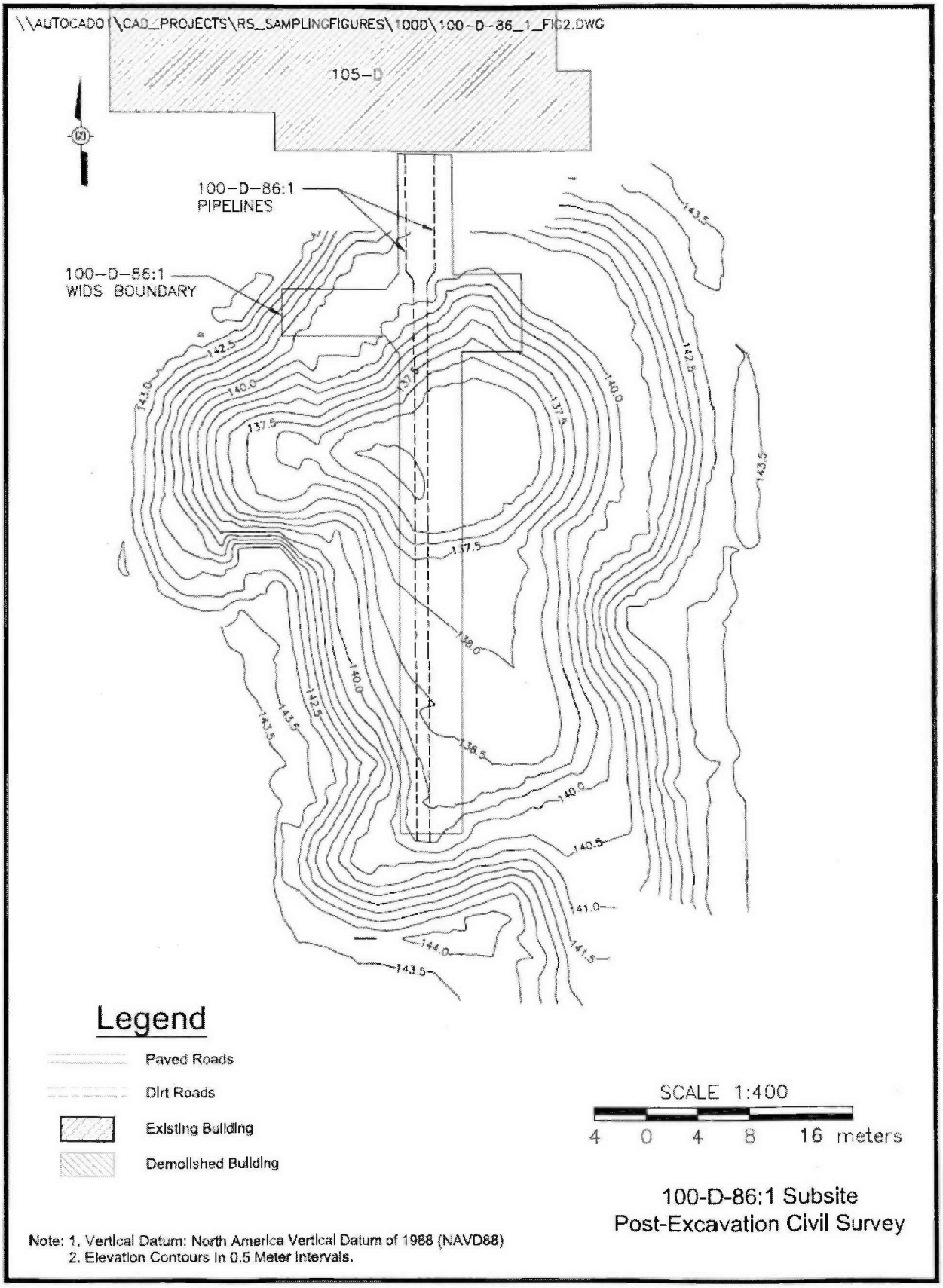


Figure 3. 100-D-86:1 Pipeline Subsite Shallow/Deep Zone and Overburden Boundaries.

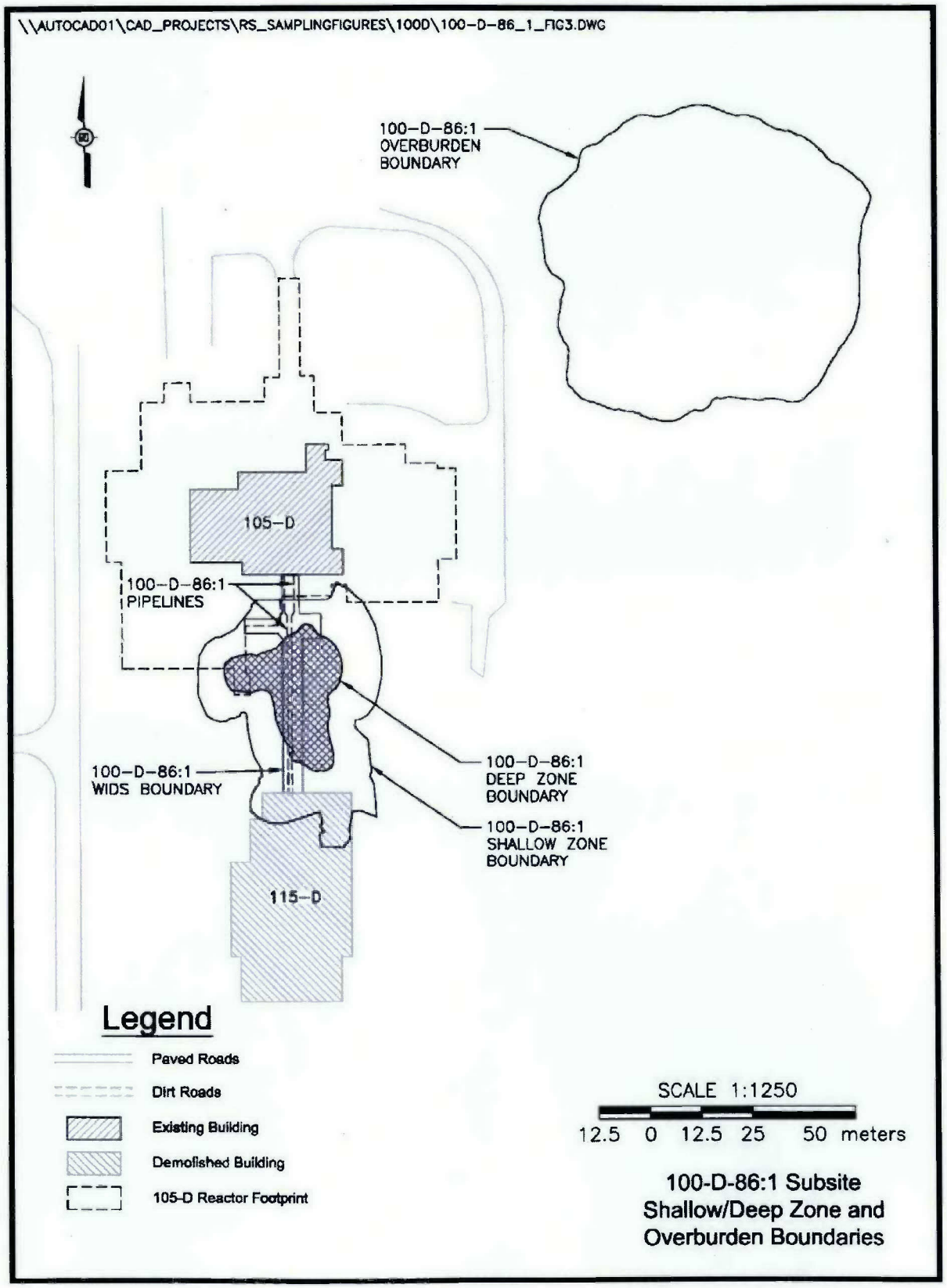


Figure 4. Photograph of 100-D-86:1 Excavation, View to the North (October 9, 2014).

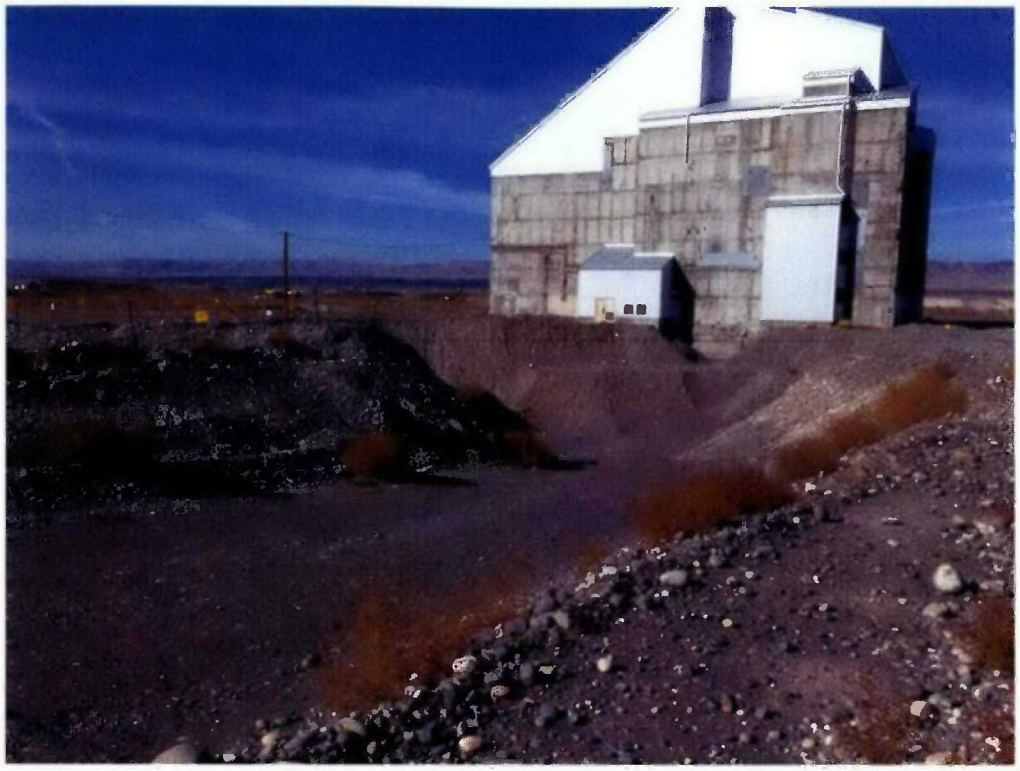


Figure 5. Photograph of 100-D-86:1 Excavation, View to the Southwest (October 9, 2014).

VERIFICATION SAMPLING ACTIVITIES

Verification soil sampling was conducted on January 6 and 7, 2015, per the *Work Instruction for Verification Sampling of the 100-D-86:1, 105-D Gas Recirculation Pipelines Subsite* (WCH 2014b). Sampling was conducted to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999).

The verification sample results are provided in Appendix C and indicate that the waste removal action achieved compliance with the remedial action objectives and RAGs for the 100-D-86:1 subsite. The following subsections provide additional discussion of the information used to develop the verification sampling design. The statistical results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Potential Concern

The COPCs identified for the 100-D-86:1 subsite included americium-241, carbon-14, cesium-137, cobalt-60, europium-152, europium-154, europium-155, plutonium-238, plutonium-239/240, strontium-90, tritium, uranium-234, uranium-235, uranium-238, total chromium, hexavalent chromium, lead, mercury, polychlorinated biphenyls (PCBs), and semivolatile organic compounds, and total petroleum hydrocarbons (TPH). Although not considered COPCs, arsenic, antimony, barium, beryllium, boron, cadmium, cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc were included in the expanded list of inductively coupled plasma metals.

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

Verification Sample Design

The 100-D-86:1 waste site remediation extended to approximately 7 m (23 ft) bgs (Figure 2); therefore, the waste site was divided into shallow zone (0 to 4.6 m [0 to 15 ft] bgs) and deep zone (greater than 0 to 4.6 m [0 to 15 ft] bgs) decision units for verification sampling. A total of three decision units were identified for the 100-D-86:1 pipeline subsite; specifically, the excavation shallow zone, the excavation deep zone, and the overburden soil stockpile. Twelve statistical soil samples plus one duplicate sample were collected from each of the three decision units. Additionally, two equipment blank samples were collected for the 100-D-86:1 subsite sampling.

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

Additional information related to verification sampling can be found in the field sampling logbook (WCH 2014a). The verification sample summary is provided in Table 2, and the sample locations are shown in Figures 6 and 7.

Table 1. Laboratory Analytical Methods for the 100-D-86:1 Subsite Excavation and Overburden Pile.

Analytical Method	Contaminants of Potential Concern
GEA – Gamma spectroscopy	Americium-241, cesium-137, cobalt-60, europium-152, europium-154, europium-155
Carbon-14 – Liquid scintillation	Carbon-14
Strontium-90	Strontium-90
Isotopic plutonium	Plutonium-238, plutonium-239/240
Isotopic uranium	Uranium-234, uranium-235, uranium-238
Tritium – Liquid scintillation	Tritium
ICP metals [a] – EPA Method 6010	Total chromium, lead
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
PAH – EPA Method 8310 [b]	Polycyclic aromatic hydrocarbons
PCBs – EPA Method 8082	Polychlorinated biphenyls
SVOA – EPA Method 8270	Semivolatile organic compounds
TPH – NWTPH-Dx	Petroleum hydrocarbons

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

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

EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
ICP = inductively coupled plasma
NWTPH-Dx = Northwest total petroleum hydrocarbons – diesel range organics
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Table 2. 100-D-86:1 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
SZ-1	J1V2H9	151514.6	573781.3	ICP metals [a], mercury, hexavalent chromium, PCB, SVOA [b], PAH [b], TPH, carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and GEA
SZ-2	J1V2J0	151524.6	573764.1	
SZ-3	J1V2J1	151524.6	573775.6	
SZ-4	J1V2J2	151524.6	573787.1	
SZ-5	J1V2J3	151534.6	573781.3	
SZ-6	J1V2J4	151544.5	573752.6	
SZ-7	J1V2J5	151544.5	573764.1	
SZ-8	J1V2J6	151544.5	573787.1	
SZ-9	J1V2J7	151564.5	573764.1	
SZ-10	J1V2J8	151564.5	573775.6	
SZ-11	J1V2J9	151564.5	573787.1	
SZ-12	J1V2K0	151574.4	573781.3	
Duplicate of SZ-4 (J1V2J2)	J1V2K1	151524.6	573787.1	

Table 2. 100-D-86:1 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
DZ-1	J1V2K3	151532.2	573779.3	ICP metals [a], mercury, hexavalent chromium, PCB, SVOA [b], PAH [b], TPH, carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and GEA
DZ-2	J1V2K4	151546.8	573778.7	
DZ-3	J1V2K5	151554.0	573778.5	
DZ-4	J1V2K6	151535.6	573772.8	
DZ-5	J1V2K7	151542.9	573772.6	
DZ-6	J1V2K8	151550.2	573772.3	
DZ-7	J1V2K9	151557.4	573772.0	
DZ-8	J1V2L0	151546.3	573766.1	
DZ-9	J1V2L1	151553.5	573765.8	
DZ-10	J1V2L2	151549.7	573759.7	
DZ-11	J1V2L3	151556.9	573759.4	
DZ-12	J1V2L4	151553.1	573753.2	
Duplicate of DZ-5 (J1V2K7)	J1V2L5	151542.9	573772.6	
OB-1	J1V2L6	151630.0	573842.3	ICP metals [a], mercury, hexavalent chromium, PCB, SVOA [b], PAH [b], TPH, carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and GEA
OB-2	J1V2L7	151630.0	573863.9	
OB-3	J1V2L8	151630.0	573885.5	
OB-4	J1V2L9	151648.7	573853.1	
OB-5	J1V2M0	151648.7	573874.7	
OB-6	J1V2M1	151648.7	573896.3	
OB-7	J1V2M2	151667.4	573842.3	
OB-8	J1V2M3	151667.4	573863.9	
OB-9	J1V2M4	151667.4	573885.5	
OB-10	J1V2M5	151667.4	573907.1	
OB-11	J1V2M6	151686.1	573853.1	
OB-12	J1V2M7	151686.1	573874.7	
Duplicate of OB-1 (J1V2L6)	J1V2M8	151630.0	573842.3	
Equipment blank 1	J1V2M9	NA	NA	ICP metals [a], mercury and SVOA, PAH
Equipment blank 2	J1V2K2	NA	NA	

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

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

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Figure 6. 100-D-86:1 Shallow and Deep Zone Excavation Sample Locations.

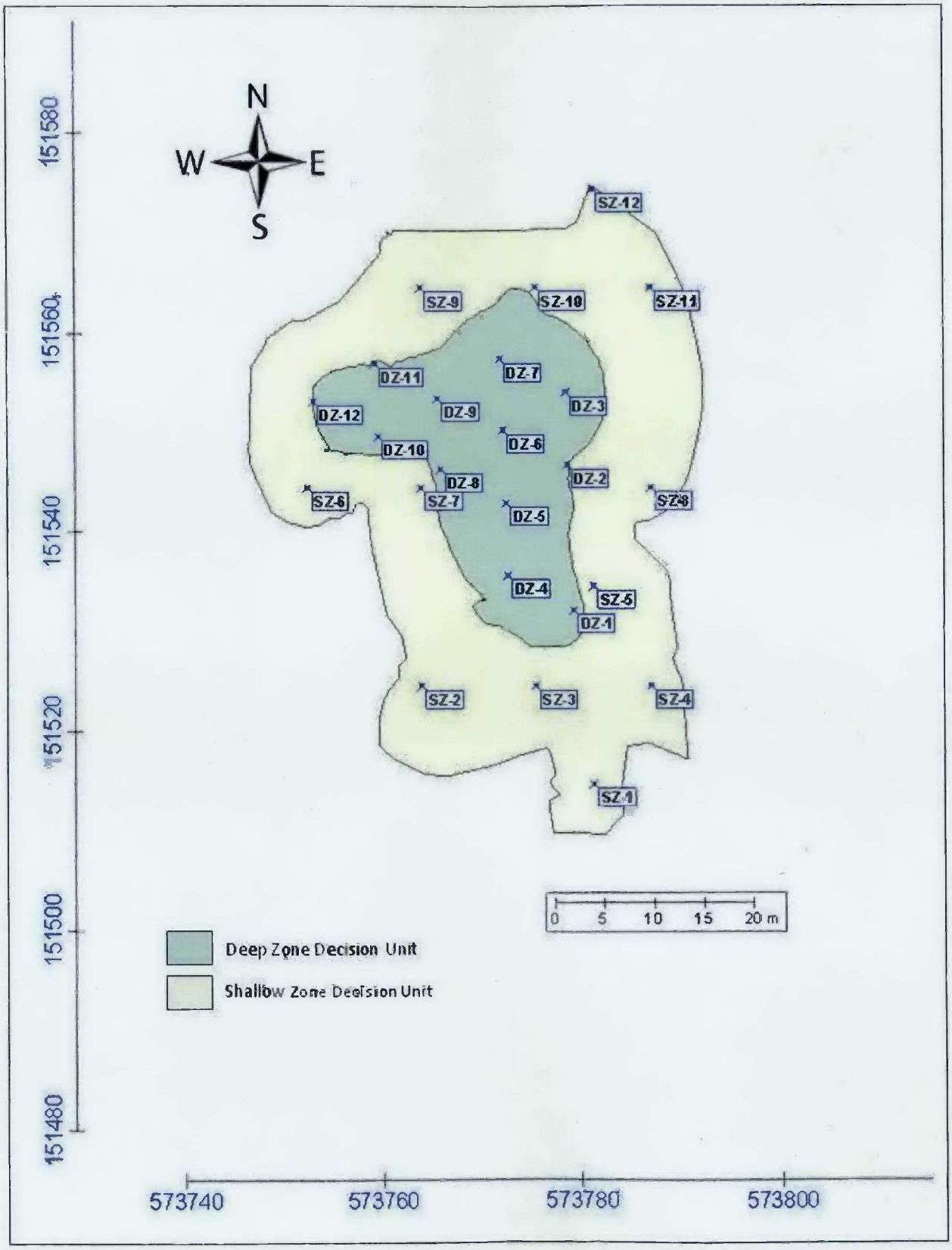
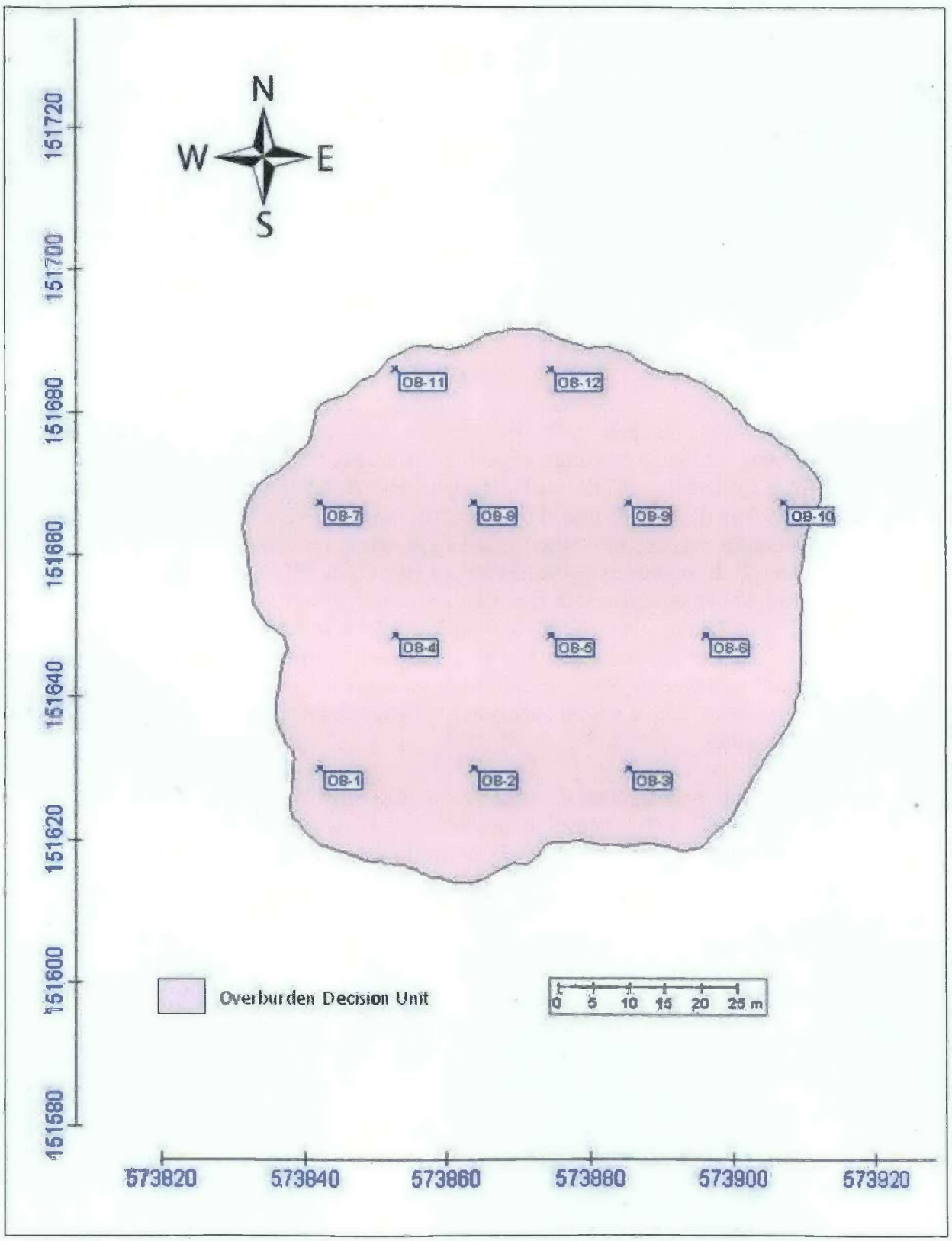


Figure 7. 100-D-86:1 Overburden Sample Locations.



Verification Sample Results

All verification samples were collected for full protocol laboratory analysis and analyzed using EPA-approved analytical methods. Evaluation of the verification data from the 100-D-86:1 subsite was performed by direct comparison of the statistical or maximum sample results for each COPC against the cleanup criteria.

The primary statistical calculation to evaluate compliance with cleanup standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each detected COPC are computed for the 100-D-86:1 subsite decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2009b). The calculations are provided in Appendix C. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the decision unit, the maximum detected value was used for comparison to the RAGs. If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC.

Comparisons of the results for each COPC from the 100-D-86:1 subsite against the RAGs are summarized in Tables 3 through 5. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2014) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in the tables. Because EPA Method 8310 (polycyclic aromatic hydrocarbons [PAH]) is specifically meant to analyze for PAH, data from this method is used preferentially over the EPA Method 8270 (semivolatile organic analysis). Therefore, PAH data from Method 8270 are excluded from the tables.

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

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-D-86:1 subsite achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 100 Area RDR/RAWP (DOE-RL 2009b).

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Shallow Zone Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Soil Lookup Values (pCi/g) [a]			Does the Result Exceed Lookup Values?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Soil Lookup Value for Groundwater Protection	Soil Lookup Value for River Protection		
Cesium-137	0.199 (<BG)	6.2	1,465	2,930	No	--
Europium-155	0.0423 (<BG)	125	-- [c]	-- [c]	No	--
Strontium-90	0.232	4.5	27.6	55.2	No	--
Uranium-234	0.173 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
Uranium-238	0.196 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
COPC	**Statistical or Maximum Result [b] (mg/kg)**	**Remedial Action Goals (mg/kg) [a]**			**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.5 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	71.7 (<BG)	5,600	200	400	No	--
Boron [e]	1.2	7,200	320	-- [f]	No	--
Cadmium [g]	0.13 (<BG)	13.9 [h]	0.81 [d]	0.81 [d]	No	--
Chromium	8.5 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	9.1 (<BG)	24	15.7 [d]	-- [f]	No	--
Copper	15.9 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium [e]	0.268	2.1 [h]	4.8	2	No	--
Lead	5.2 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	339 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.17 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [e]	0.32	400	8	-- [f]	No	--
Nickel	10.6 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	66.7 (<BG)	560	85.1 [d]	-- [f]	No	--
Zinc	47.0 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range EXT	78	200	200	200	No	--
TPH – diesel range	19	200	200	200	No	--
Acenaphthene	0.014	4,800	96	129	No	--
Benzo(a)anthracene	0.042	1.37	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(a)pyrene	0.032	0.137	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(b)fluoranthene	0.024	1.37	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(ghi)perylene [k]	0.014	2,400	48	192	No	--
Benzo(k)fluoranthene	0.011	1.37	0.015 [i]	0.015 [i]	No	--
Chrysene	0.046	13.7	0.12	0.01 [i]	No	--
Fluoranthene	0.093	3,200	64	18.0	No	--

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Shallow Zone Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Fluorene	0.014	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.016	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [k]	0.076	24,000	240	1,920	No	--
Pyrene	0.11	2,400	48	192	No	--
Aroclor-1254	0.084	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]
Aroclor-1260	0.013	0.5	0.017 [i]	0.017 [i]	No	--
Total PCBs	0.097	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).

[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations* (Appendix C).

[c] No value; because the K_d value for this contaminant is greater than 80 mL/g, RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), predicts that the contaminant will show no migration within the 100 Area vadose zone, and no impact on groundwater or the Columbia River.

[d] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).

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

[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], [Method B for surface waters]).

[g] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[h] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]).

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

[j] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, aroclor-1254, and total PCBs are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [aroclor-1254 with a K_d of 75.6 mL/g]). The vadose zone underlying the 100-D-86:1 waste site is approximately 18 m (59 ft) thick. Therefore, residual concentrations of benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, aroclor-1254, and total PCBs are predicted to be protective of groundwater and the Columbia River.

[k] Toxicity data for this chemical are not available. Cleanup levels for benzo(ghi)perylene are based on the surrogate chemical pyrene; cleanup levels for phenanthrene are based on the surrogate chemical anthracene.

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
PCB = polychlorinated biphenyl
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Deep Zone Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Soil Lookup Values (pCi/g) [a]		Does the Result Exceed Lookup Values?	Does the Result Pass RESRAD Modeling?
		Soil Lookup Value for Groundwater Protection	Soil Lookup Value for River Protection		
Cesium-137	0.237 (<BG)	1,465	2,930	No	--
Strontium-90	0.352	27.6	55.2	No	--
Uranium-234	0.191 (<BG)	1.1 [c]	1.1 [c]	No	--
Uranium-238	0.223 (<BG)	1.1 [c]	1.1 [c]	No	--
COPC	**Statistical or Maximum Result [b] (mg/kg)**	**Remedial Action Goals (mg/kg) [a]**		**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Soil Cleanup Level for Groundwater Protection	**Soil Cleanup Level for River Protection**		
Arsenic	2.0 (<BG)	20 [c]	20 [c]	No	--
Barium	95.3 (<BG)	200	400	No	--
Cadmium [d]	0.12 (<BG)	0.81 [c]	0.81 [c]	No	--
Chromium	4.7 (<BG)	18.5 [c]	18.5 [c]	No	--
Cobalt	9.8 (<BG)	15.7 [c]	-- [e]	No	--
Copper	14.2 (<BG)	59.2	22.0 [c]	No	--
Hexavalent chromium [f]	0.230	4.8	2	No	--
Lead	3.6 (<BG)	10.2 [c]	10.2 [c]	No	--
Manganese	303 (<BG)	512 [c]	512 [c]	No	--
Mercury	0.30 (<BG)	0.33 [c]	0.33 [c]	No	--
Nickel	8.2 (<BG)	19.1 [c]	27.4	No	--
Vanadium	85.6	85.1 [c]	-- [e]	Yes	Yes [g]
Zinc	45.1 (<BG)	480	67.8 [c]	No	--
TPH – diesel range EXT	22	200	200	No	--
TPH – diesel range	11	200	200	No	--
Benzo(a)anthracene	0.024	0.015 [h]	0.015 [h]	Yes	Yes [g]
Benzo(a)pyrene	0.040	0.015 [h]	0.015 [h]	Yes	Yes [g]
Benzo(b)fluoranthene	0.024	0.015 [h]	0.015 [h]	Yes	Yes [g]
Benzo(ghi)perylene [i]	0.030	48	192	No	--
Benzo(k)fluoranthene	0.0086	0.015 [h]	0.015 [h]	No	--
Chrysene	0.028	0.12	0.1 [h]	No	--
Fluoranthene	0.060	64	18.0	No	--
Indeno(1,2,3-cd)pyrene	0.019	0.33 [h]	0.33 [h]	No	--
Phenanthrene [i]	0.037	240	1,920	No	--
Pyrene	0.074	48	192	No	--

Table 4. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Deep Zone Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]		Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Aroclor-1254	0.042	0.017 [h]	0.017 [h]	Yes	Yes [g]

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations* (Appendix C).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).
[d] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[e] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], [Method B for surface waters]).
[f] No Hanford Site-specific or Washington State background value available.
[g] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of vanadium, benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, and aroclor-1254 are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [aroclor-1254 with a K_d of 75.6 mL/g]). The vadose zone underlying the 100-D-86:1 waste site is approximately 18 m (59 ft) thick. Therefore, residual concentrations of vanadium, benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, and aroclor-1254 are predicted to be protective of groundwater and the Columbia River.
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2).
[i] Toxicity data for this chemical are not available. Cleanup levels for benzo(ghi)perylene are based on the surrogate chemical pyrene; cleanup levels for phenanthrene are based on the surrogate chemical anthracene.

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 5. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Soil Lookup Values (pCi/g) [a]			Does the Result Exceed Lookup Values?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Soil Lookup Value for Groundwater Protection	Soil Lookup Value for River Protection		
Cesium-137	0.382 (<BG)	6.2	1,465	2,930	No	--
Europium-152	0.0524	3.3	-- [c]	-- [c]	No	--
Europium-155	0.0354 (<BG)	125	-- [c]	-- [c]	No	--
Strontium-90	0.344	4.5	27.6	55.2	No	--
Uranium-234	0.219 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
Uranium-238	0.192 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
COPC	**Statistical or Maximum Result [b] (mg/kg)**	**Remedial Action Goals (mg/kg) [a]**			**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Arsenic	2.7 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	65.8 (<BG)	5,600	200	400	No	--
Cadmium [e]	0.15 (<BG)	13.9 [f]	0.81 [d]	0.81 [d]	No	--
Chromium	7.7 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	8.4 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	14.1 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium [h]	0.169	2.1 [f]	4.8	2	No	--
Lead	6.0 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	325 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.18 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [h]	0.27	400	8	-- [g]	No	--
Nickel	10.5 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	62.5 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	45.0 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range EXT	11	200	200	200	No	--
TPH – diesel range	6.2	200	200	200	No	--
Acenaphthene	0.045	4,800	96	129	No	--
Benzo(a)anthracene	0.073	1.37	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(a)pyrene	0.078	0.137	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(b)fluoranthene	0.043	1.37	0.015 [i]	0.015 [i]	Yes	Yes [j]
Benzo(ghi)perylene [k]	0.15	2,400	48	192	No	--
Benzo(k)fluoranthene	0.021	1.37	0.015 [i]	0.015 [i]	Yes	Yes [j]
Bis(2-ethylhexyl)phthalate	0.20	71.4	0.6	0.36	No	--
Carbazole	0.087	50	0.438	-- [g]	No	--

Table 5. Comparison of Contaminant Concentrations to Action Levels for the 100-D-86:1 Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Chrysene	0.081	13.7	0.12	0.1 [i]	No	--
Di-n-butylphthalate	0.038	8,000	160	540	No	--
Dibenz(a,h)anthracene	0.041	1.37	0.03 [i]	0.03 [i]	Yes	Yes [j]
Dibenzofuran	0.061	160	3.20	-- [g]	No	--
Fluoranthene	0.14	3,200	64	18.0	No	--
Fluorene	0.044	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.16	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [k]	0.064	24,000	240	1,920	No	--
Pyrene	0.18	2,400	48	192	No	--
Aroclor-1254	0.025	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]
Aroclor-1260	0.065	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]
Total PCBs	0.090	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).

[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations* (Appendix C).

[c] No value; because the K_d value for this contaminant is greater than 80 mL/g, RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), predicts that the contaminant will show no migration within the 100 Area vadose zone, and no impact on groundwater or the Columbia River.

[d] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).

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

[f] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]).

[g] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], [Method B for surface waters]).

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

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

[j] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [aroclor-1254 with a K_d of 75.6 mL/g]). The vadose zone underlying the 100-D-86:1 waste site is approximately 18 m (59 ft) thick. Therefore, residual concentrations of benzo(a)anthracene benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs are predicted to be protective of groundwater and the Columbia River.

[k] Toxicity data for this chemical are not available. Cleanup levels for benzo(ghi)perylene are based on the surrogate chemical pyrene; cleanup levels for phenanthrene are based on the surrogate chemical anthracene.

--	= not applicable	RDL	= required detection limit
BG	= background	RDR/RAWP	= remedial design report/remedial action work plan
COPC	= contaminant of potential concern	RESRAD	= RESidual RADioactivity (dose model)
K_d	= distribution coefficient	TPH	= total petroleum hydrocarbons
PCB	= polychlorinated biphenyl	WAC	= *Washington Administrative Code*
RAG	= remedial action goal		

Attainment of Nonradionuclide RAGs

Tables 3 through 5 compare the cleanup verification sample values for the 100-D-86:1 subsite shallow zone, deep zone, and overburden soil stockpile decision units to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs with the exception of vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs. However, given the lowest distribution coefficient (K_d) of these contaminants (aroclor-1254 with a K_d of 75.6 mL/g), none would be expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b). The vadose zone underlying the 100-D-86:1 subsite is approximately 18 m (59 ft) thick. Therefore, residual concentrations of vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aroclor-1254, aroclor-1260, and total PCBs are predicted to be protective of groundwater and the Columbia River.

Attainment of Radionuclide Direct Exposure RAGs

Evaluation of RAG attainment for radionuclides was performed using the single-radionuclide dose-equivalence lookup values. The model used to develop these dose-equivalence lookup values is presented in the 100 Area RDR/RAWP (DOE-RL 2009b). A comparison of the radionuclide verification sample results for the statistical data set to the cumulative direct exposure radiological dose limit of 15 mrem/yr was conducted using sum of fractions calculations (Appendix C). The sum of fractions were conservatively calculated for the 100-D-86:1 subsite overburden and shallow zone decision units data sets using the greater of the statistical or maximum value for each COPC.

The sum of fractions shown in the *100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations* in Appendix C determined that the maximum predicted total radiological dose is 1.26 mrem/yr for the shallow zone decision unit. Comparing this to the dose limit of <15 mrem/yr the requirement is met.

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-86:1 subsite is included in the *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculation* in Appendix C of this remaining sites verification package, where half or more of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and aroclor-1254, which fail one or more parts of the three-part test to be protective of groundwater and the Columbia River.

However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentration of these contaminants are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [aroclor-1254 with a K_d of 75.6 mL/g). The vadose zone underlying the 100-D-86:1 subsite is approximately 18 m (59 ft) thick. Therefore, the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and aroclor-1254 are predicted to be protective of groundwater and the Columbia River.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aroclor-1254, and aroclor-1260, which fail one or more parts of the three-part test to be protective of groundwater and the Columbia River. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentration of these contaminants are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [aroclor-1254 with a K_d of 75.6 mL/g]). The vadose zone underlying the 100-D-86:1 subsite is approximately 18 m (59 ft) thick. Therefore, the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aroclor-1254, and aroclor-1260 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-86:1 subsite, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 5.5×10^{-2}, which is less than 1.0. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1×10^{-6}, and the cumulative carcinogenic risk value is 1.3×10^{-6}, which is less than 1×10^{-5}. The 100-D-86:1 subsite meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100 Area RDR/RAWP (DOE-RL 2009b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-86:1 subsite included a calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for

which there is no background value. In addition, the soil-partitioning coefficients for these contaminants must be less than that necessary to show no migration to groundwater in 1,000 years based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b). Based on this model and a vadose zone of approximately 18 m (59 ft) in thickness, a K_d of 4.1 or greater is required to show no predicted migration to groundwater in 1,000 years. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-D-86:1 subsite is 6.0×10^{-2}, which is less than 1.0. The excess cancer risk for carbazole, the only constituent subject to the excess cancer risk calculation, is 2.0×10^{-7}, which is less than the individual and cumulative excess carcinogenic risk of less than 1×10^{-6} and 1×10^{-5}, respectively. Therefore, nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

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

The DQA for the 100-D-86:1 subsite established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in a Washington Closure Hanford project-specific database for data evaluation prior to archival in Hanford Environmental Information System and are summarized in Appendix C. The detailed DQA is presented in Appendix D.

SUMMARY FOR INTERIM CLOSURE

The 100-D-86:1 subsite has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009b). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at the site meet the remedial action objectives for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-86:1 subsite to Interim Closed Out. Contamination above direct exposure levels was not observed in the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites are not required.

REFERENCES

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

WCH, 2010, *100-D-86:1, 105-D Gas Recirculation Pipelines Waste Site for Remedial Action*, CCN 150853 to S. W. Callison from M. L. Proctor, Washington Closure Hanford, Richland, Washington, May 6.

WCH, 2014a, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-03 Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-D-86:1, 105-D Gas Recirculation Pipelines Subsite,* 0100D-WI-G0147, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 100-D-86:1 Subsite [a].

Hazardous Substance		2001 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Maximum Result
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
	Background	Metals (mg/kg)							
Boron	NA	0.5	NA	NA	NA	NA	NA	NA	1.2
Manganese	512	1,100 [d]	NA	1,500	220	450	4,300	4,000	339 (<BG)
Mercury	0.33	0.3	0.1	5.5	NA	NA	NA	NA	0.30 (<BG)
Vanadium	85.1	2	NA	NA	NA	NA	7.8	280	85.6
Zinc	68.8	86 [d]	200	360	160	120	46	79	47.0 (<BG)

NOTE: Shaded cells indicate screening values that are exceeded.

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

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

[c] Wildlife.

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

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

APPENDIX B

GLOBAL POSITIONING ENVIRONMENTAL RADIOLOGICAL SURVEYOR (GPERS) SURVEYS

Figure B-1. 100-D-86:1 Overburden Stockpile GPERS Survey Gamma Track Map (March 2014).

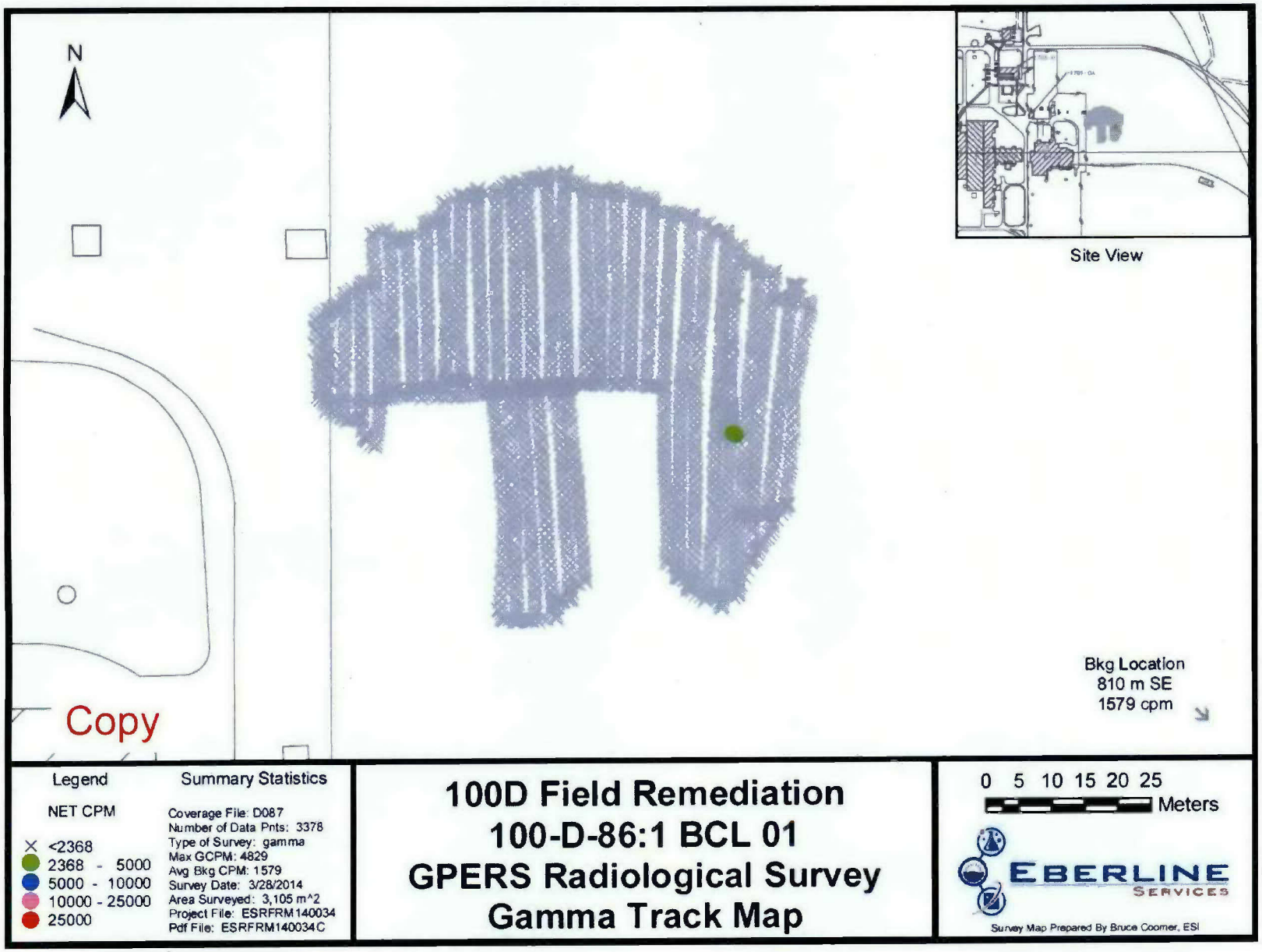


Figure B-2. 100-D-86:1 Overburden Stockpile GPERS Survey Beta Track Map (November 2014).

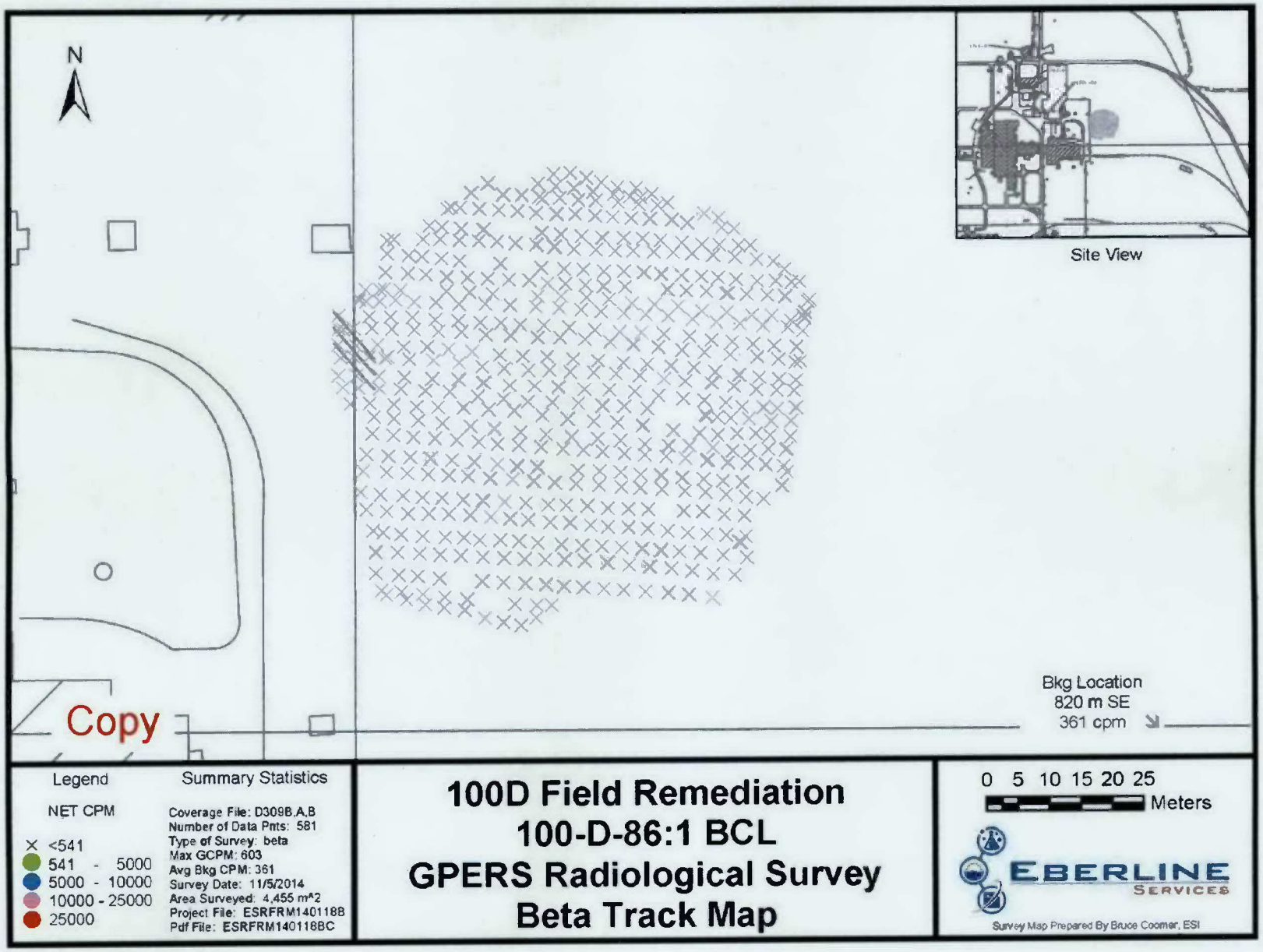


Figure B-3. 100-D-86:1 Overburden Stockpile GPERS Survey Gamma Track Map (November 2014).

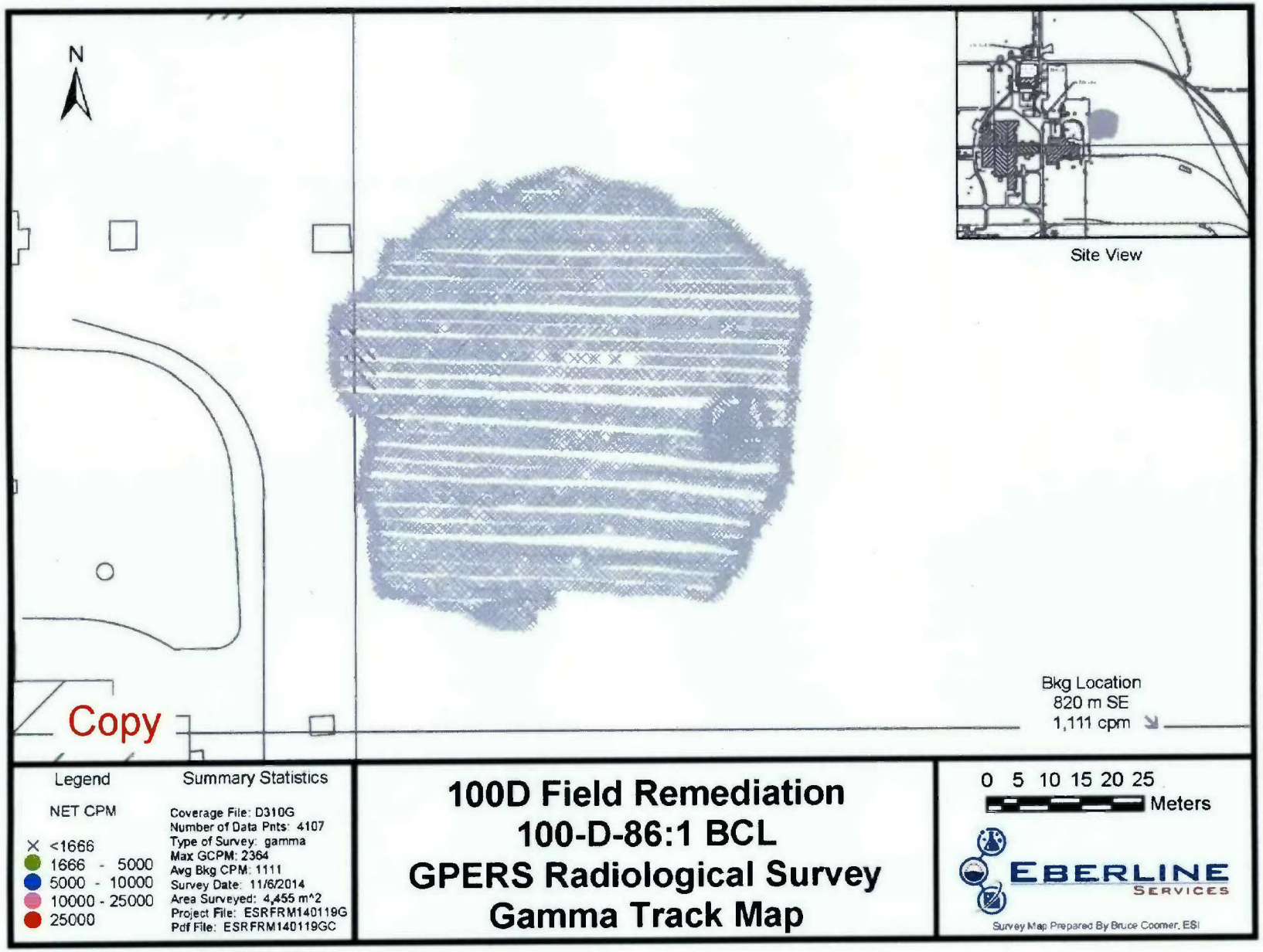


Figure B-4. 100-D-86:1 Excavation GPERS Survey Radiological Beta Track Map.

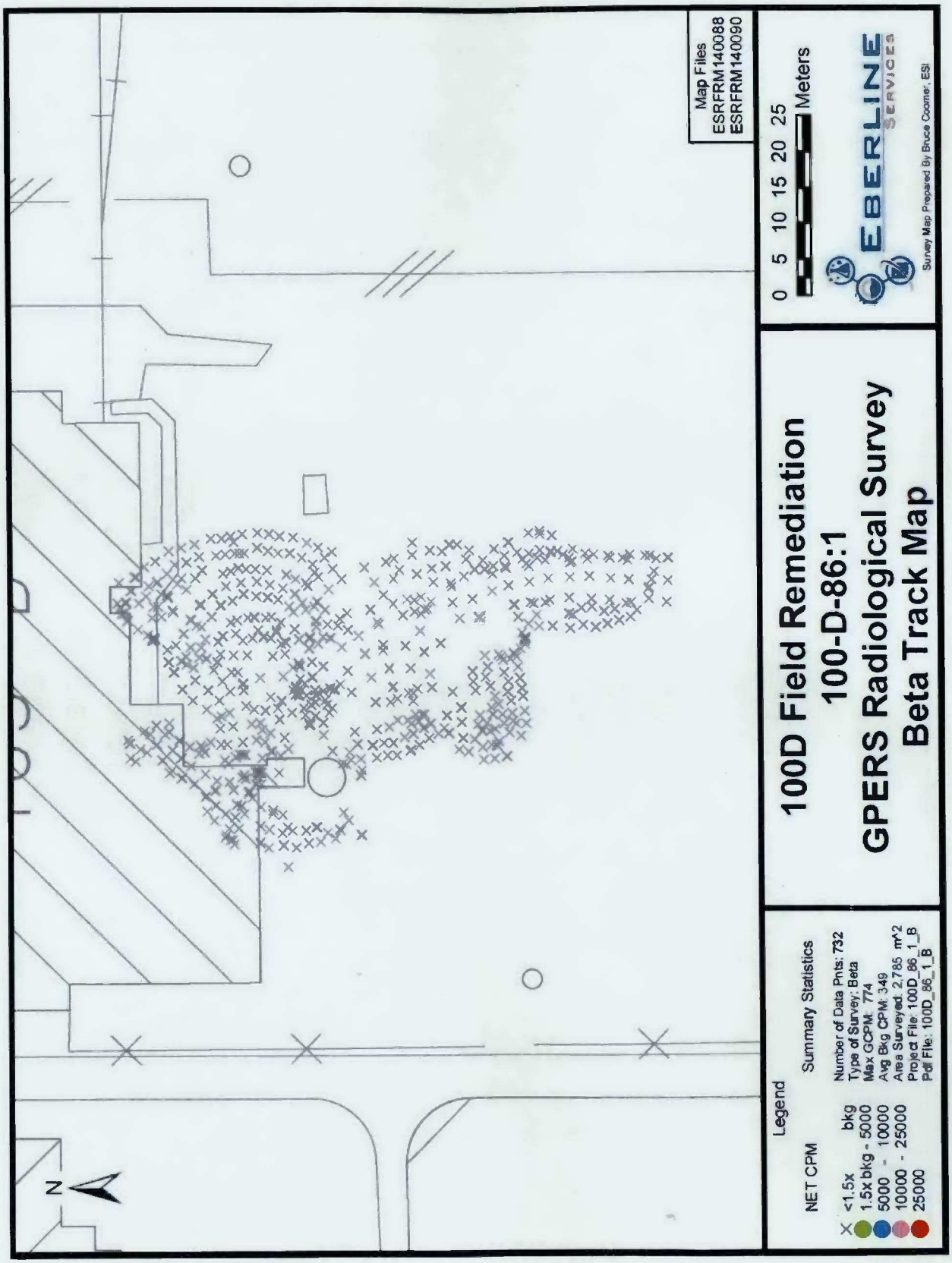
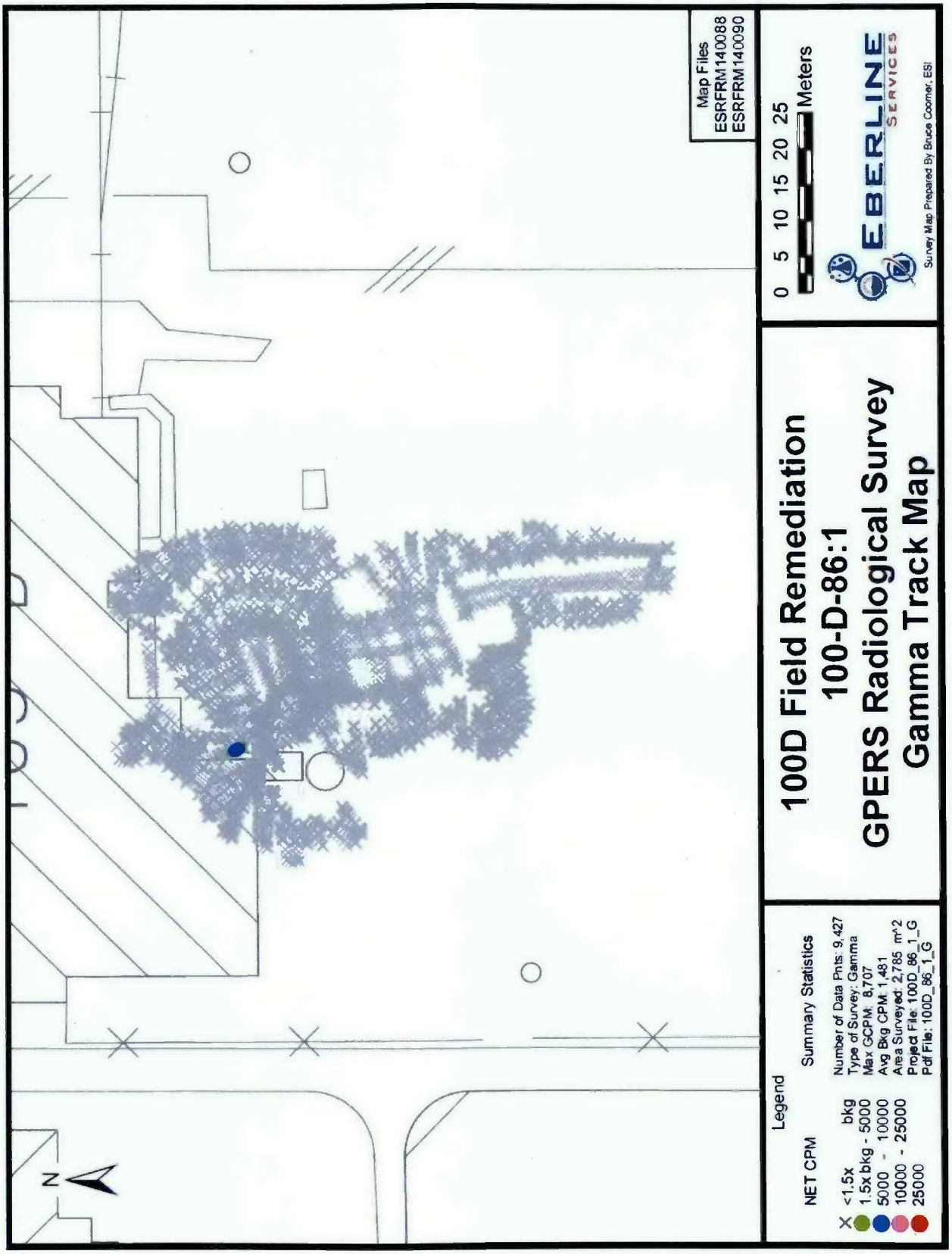


Figure B-5. 100-D-86:1 Excavation GPERS Radiological Survey Gamma Map.



APPENDIX C

CALCULATIONS

APPENDIX C

CALCULATION BRIEFS

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

100-D-86:1 Subsite Cleanup Verification 95% UCL Calculation, 0100D-CA-V0586, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations, 0100D-CA-V0587, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-86:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100D-CA-V0588, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

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

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0586

Subject: 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2010

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 30 Attm. 1 = 23 Total = 54	J. D. Skoglie	I. B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	6/1/15

SUMMARY OF REVISION

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 03/10/15 **Calc. No.** 0100D-CA-V0586 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 03/10/15
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 1 of 30

Summary

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

Table of Contents:
Sheets 1 to 4 - Calculation Sheet Summary
Sheet 5 to 20- Calculation Sheet Verification Data - Shallow Zone, Overburden, and the Deep Zone
Sheet 21 to 27 - Ecology Software (MTCAStat) Results
Sheet 28 to 30 - Calculation Sheet Duplicate Analysis
Attachment 1 - 100-D-86:1 Verification Sampling Results (23 sheets)

Given/References:
1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are taken from DOE-RL (2005b), DOE-RL (2001), and Ecology (1996).
3) DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
6) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
7) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets)*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
8) Ecology, 1996, *Model Toxic Control Act Cleanup Levels and Risk Calculations (CLARC II)*, Publication #94-145, Washington State Department of Ecology, Olympia, Washington.
9) Ecology, 2014, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
10) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code*.

Solution:
Calculation methodology is described in Ecology Pub. #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 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-86:1 subsite. The data were entered into an EXCEL 2010 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2009b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
The 100-D-86:1 subsite underwent statistical sampling at three decision units for verification sampling that included the shallow zone, overburden, and the deep zone.

Analytical results for all sampling locations are summarized in the tables provided on sheets 3 and 4. Further information of the sample data quality is presented in the data quality assessment section of the associated RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 03/10/15 **Calc. No.** 0100D-CA-V0586 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 03/10/15
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 2 of 30

Summary (continued)

Methodology, continued:

For nonradioactive analytes with ≤50% of the data below detection limits, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, as determined by direct inspection of the sample results (Attachment 1), the maximum detected value for the data set (which includes primary and duplicate samples) is used instead of the 95% UCL, and no further calculations are performed for those data sets. For convenience, these maximum detected values are included in the summary tables that follow. The 95% UCL was not calculated for data sets with no reported detections. Calculated cleanup levels are not available in Ecology (2014) under WAC 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COCs/COPCs and are also not included in these calculations. The 95% UCL values were not calculated for potassium-40, radium-226, radium-228, thorium-228, and thorium-232 based on natural occurence at the Hanford Site.

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 either the duplicate or split value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table 2-1 of the SAP (DOE-RL 2009a) for certain constituents. All other constituents will have their own pre-determined TDL's based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate/split 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/split result exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 03/12/15 **Calc. No.** 0100D-CA-V0586 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 03/12/15
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 3 of 30

Summary (continued)

QUALIFIER LIST

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

ACRONYM LIST

-- = not applicable
DE = direct exposure
DZ = deep zone
EXC = excavation
GW = groundwater
MDA = minimum detection allowed
MTCA = *Model Toxics Control Act*
OB = overburden
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
SZ = shallow zone
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

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

Analyte	Shallow Zone Duplicate Analysis	Overburden Duplicate Analysis	Deep Zone Duplicate Analysis
Cesium-137	--	18.8%	--
Potassium-40	3.9%	12.2%	6.7%
Aluminum	3.9%	1.3%	2.1%
Barium	2.1%	6.6%	5.7%
Calcium	4.9%	7.0%	3.7%
Chromium	10.6%	24.2%	--
Copper	5.9%	6.2%	7.4%
Iron	5.3%	8.8%	6.5%
Magnesium	12.5%	6.7%	1.0%
Manganese	4.2%	3.9%	1.7%
Silicon	1.3%	***58.6%***	1.0%
Sodium	--	15.6%	2.4%
Vanadium	3.9%	3.7%	11.9%
Zinc	4.3%	3.3%	5.9%

[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.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie **Date** 03/12/15 **Calc. No.** 0100D-CA-V0586 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 03/12/15
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 30

Summary (continued)

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

Results Summary [a]

Analyte	Shallow Zone		Overburden		Deep Zone		Units
	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	
Cesium-137	0.199	--	0.382	--	0.237	--	pCi/g
Europium-152	--	--	0.0524	--	--	--	pCi/g
Europium-155	0.0423	--	0.0354	--	--	--	pCi/g
Total beta radiostrontium	0.232	--	0.344	--	0.352	--	pCi/g
Uranium-234	0.173	--	0.219	--	0.191	--	pCi/g
Uranium-238	0.196	--	0.195	--	0.223	--	pCi/g
Arsenic	3.5	--	2.7	--	2.0	--	mg/kg
Barium	71.7	--	65.8	--	95.3	--	mg/kg
Boron	--	1.2	--	--	--	--	mg/kg
Cadmium	0.13	--	0.15	--	0.12	--	mg/kg
Chromium	8.5	--	7.7	--	4.7	--	mg/kg
Cobalt	9.1	--	8.4	--	9.8	--	mg/kg
Copper	15.9	--	14.1	--	14.2	--	mg/kg
Hexavalent chromium	0.268	--	0.169	--	--	0.230	mg/kg
Lead	5.2	--	6.0	--	3.6	--	mg/kg
Manganese	339	--	325	--	303	--	mg/kg
Mercury	0.17	--	0.18	--	--	0.30	mg/kg
Molybdenum	--	0.32	--	0.27	--	--	mg/kg
Nickel	10.6	--	10.5	--	8.2	--	mg/kg
Vanadium	66.7	--	62.5	--	85.6	--	mg/kg
Zinc	47.0	--	45.0	--	45.1	--	mg/kg
TPH - Diesel Range EXT	78	--	11	--	--	22	mg/kg
TPH - Diesel Range	19	--	6.2	--	--	11	mg/kg
Acenaphthene (Method 8270)	--	--	--	0.092	--	--	mg/kg
Acenaphthene (Method 8310)	--	0.014	--	0.045	--	--	mg/kg
Acenapthylene (Method 8270)	--	--	--	0.018	--	--	mg/kg
Anthracene (Method 8270)	--	0.020	--	0.34	--	--	mg/kg
Benzo(a)anthracene (Method 8270)	--	0.057	--	0.60	--	0.040	mg/kg
Benzo(a)anthracene (Method 8310)	--	0.042	0.073	--	--	0.024	mg/kg
Benzo(a)pyrene (Method 8270)	--	0.053	--	0.028	--	0.034	mg/kg
Benzo(a)pyrene (Method 8310)	--	0.032	0.078	--	--	0.040	mg/kg
Benzo(b)fluoranthene (Method 8270)	--	0.053	--	0.82	--	0.040	mg/kg
Benzo(b)fluoranthene (Method 8310)	--	0.024	0.043	--	--	0.024	mg/kg
Benzo(ghi)perylene (Method 8270)	--	0.029	--	0.22	--	--	mg/kg
Benzo(ghi)perylene (Method 8310)	--	0.014	--	0.15	--	0.030	mg/kg
Benzo(k)fluoranthene (Method 8310)	--	0.011	0.021	--	--	0.0086	mg/kg
Bis(2-ethylhexyl)phthalate	--	--	--	0.20	--	--	mg/kg
Carbazole	--	--	--	0.087	--	--	mg/kg
Chrysene (Method 8270)	--	0.068	--	0.65	--	0.048	mg/kg
Chrysene (Method 8310)	--	0.046	0.081	--	--	0.028	mg/kg
Di-n-butylphthalate	--	--	--	0.038	--	--	mg/kg
Dibenz[ah]anthracene (Method 8270)	--	--	--	0.065	--	--	mg/kg
Dibenz[ah]anthracene (Method 8310)	--	--	--	0.041	--	--	mg/kg
Dibenzofuran	--	--	--	0.061	--	--	mg/kg
Fluoranthene (Method 8270)	--	0.12	--	1.4	--	0.072	mg/kg
Fluoranthene (Method 8310)	--	0.093	0.14	--	--	0.060	mg/kg
Fluorene (Method 8270)	--	--	--	0.15	--	--	mg/kg
Fluorene (Method 8310)	--	0.014	--	0.044	--	--	mg/kg
Indeno(1,2,3-cd)pyrene (Method 8270)	--	0.028	--	0.24	--	--	mg/kg
Indeno(1,2,3-cd)pyrene (Method 8310)	--	0.016	--	0.16	--	0.019	mg/kg
Phenanthrene (Method 8270)	--	0.092	--	1.2	--	0.043	mg/kg
Phenanthrene (Method 8310)	--	0.076	0.064	--	--	0.037	mg/kg
Pyrene (Method 8270)	--	0.13	0.31	--	--	0.077	mg/kg
Pyrene (Method 8310)	--	0.11	0.18	--	--	0.074	mg/kg
Aroclor-1254	--	0.084	0.025	--	--	0.042	mg/kg
Aroclor-1260	--	0.013	--	0.065	--	--	mg/kg
3 Part Test Evaluation:							
95% UCL or Maximum[a] > Cleanup Limit?	NO	YES	YES	YES	NA	YES	
> 10% above Cleanup Limit?	NO	YES	YES	YES	NA	YES	
Any sample > 2x Cleanup Limit?	NO	YES	YES	YES	NA	YES	

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

CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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Date 03/10/15
Sheet No. 5 of 30

100-D-86:1 Subsite Statistical Calculations
Verification Data - Shallow Zone

Sample Area	Sample Number	Sample Date	Cesium-137			Europium-155			Total beta radiostrontium			Uranium-234			Uranium-238		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-4	J1V2J2	1/7/15	0.0110	U	0.0305	-0.00112	U	0.0981	0.231	U	0.416	0.131		0.0534	0.204		0.0590
Duplicate of J1V2J2	J1V2K1	1/7/15	-0.0117	U	0.0245	0.0148	U	0.0632	-0.0379	U	0.372	0.119		0.0537	0.147		0.0361
SZ-1	J1V2H9	1/7/15	0.0425		0.0201	0.0335	U	0.0447	0.131	U	0.398	0.126		0.0639	0.159		0.0430
SZ-2	J1V2J0	1/7/15	0.00959	U	0.0235	0.0662		0.0378	0.176	U	0.374	0.242		0.0632	0.208		0.0632
SZ-3	J1V2J1	1/7/15	0.0609		0.0187	0.0478		0.0349	-0.0670	U	0.414	0.160		0.0649	0.0484		0.0437
SZ-5	J1V2J3	1/7/15	-0.00689	U	0.0149	0.0358		0.0312	-0.00137	U	0.375	0.125		0.0507	0.153		0.0378
SZ-6	J1V2J4	1/7/15	0.147		0.0206	0.0337	U	0.0446	0.00382	U	0.563	0.113		0.0437	0.161		0.0437
SZ-7	J1V2J5	1/7/15	0.211		0.0238	-0.00749	U	0.0892	0.425		0.359	0.199		0.0620	0.262		0.0418
SZ-8	J1V2J6	1/7/15	0.0980		0.0166	0.0235	U	0.0346	0.00967	U	0.418	0.119		0.0605	0.225		0.0407
SZ-9	J1V2J7	1/7/15	0.292		0.0225	0.0689	U	0.0708	0.220	U	0.436	0.0971		0.0593	0.179		0.0593
SZ-10	J1V2J8	1/7/15	0.555		0.0202	0.0307	U	0.0390	0.550		0.436	0.144		0.0532	0.198		0.0358
SZ-11	J1V2J9	1/7/15	0.00489	U	0.0265	0.0364	U	0.0626	0.0993	U	0.402	0.135		0.0688	0.137		0.0463
SZ-12	J1V2K0	1/7/15	0.0371		0.0260	-0.00818	U	0.0735	0.115	U	0.364	0.227		0.0540	0.147		0.0363

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Europium-155 pCi/g	Total beta radiostrontium pCi/g	Uranium-234 pCi/g	Uranium-238 pCi/g
SZ-4	J1V2J2/ J1V2K1	1/7/15	-0.000350	0.00684	0.0966	0.125	0.176
SZ-1	J1V2H9	1/7/15	0.0425	0.0335	0.131	0.126	0.159
SZ-2	J1V2J0	1/7/15	0.00959	0.0662	0.176	0.242	0.208
SZ-3	J1V2J1	1/7/15	0.0609	0.0478	-0.0670	0.160	0.0484
SZ-5	J1V2J3	1/7/15	-0.00689	0.0358	-0.00137	0.125	0.153
SZ-6	J1V2J4	1/7/15	0.147	0.0337	0.00382	0.113	0.161
SZ-7	J1V2J5	1/7/15	0.211	-0.00749	0.425	0.199	0.262
SZ-8	J1V2J6	1/7/15	0.0980	0.0235	0.00967	0.119	0.225
SZ-9	J1V2J7	1/7/15	0.292	0.0689	0.220	0.0971	0.179
SZ-10	J1V2J8	1/7/15	0.555	0.0307	0.550	0.144	0.198
SZ-11	J1V2J9	1/7/15	0.00489	0.0364	0.0993	0.135	0.137
SZ-12	J1V2K0	1/7/15	0.0371	-0.00818	0.115	0.227	0.147

Statistical Computations

	Cesium-137	Europium-155	Total beta radiostrontium	Uranium-234	Uranium-238
95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.
N	12	12	12	12	12
% < Detection limit	33%	75%	83%	0%	0%
Mean	0.121	0.0306	0.146	0.151	0.171
Standard deviation	0.165	0.0246	0.181	0.0468	0.0528
Z-statistic	1.64	1.64	1.64	1.64	1.64
95% UCL on mean	0.199	0.0423	0.232	0.173	0.196
Maximum value	0.555	0.0662	0.550	0.242	0.262

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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100-D-86:1 Subsite Statistical Calculations

Verification Data - Shallow Zone

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Manganese mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	2.8		0.66	61.6	X	0.076	0.14	B	0.041	8.9	X	0.058	6.8	X	0.10	13.1	X	0.22	0.200		0.155	3.7		0.27	281	X	0.10
Duplicate of J1V2J2	J1V2K1	1/7/15	3.3		0.63	62.9	X	0.072	0.12	B	0.039	9.9	X	0.055	7.2	X	0.095	13.9	X	0.21	0.180		0.155	4.1		0.26	293	X	0.095
SZ-1	J1V2H9	1/7/15	2.5		0.69	64.5	X	0.080	0.11	B	0.043	7.9	X	0.061	7.5	X	0.10	13.6	X	0.23	0.317		0.155	4.4		0.28	287	X	0.10
SZ-2	J1V2J0	1/7/15	3.8		0.66	66.3	X	0.076	0.11	B	0.041	9.1	X	0.058	9.1	X	0.10	18.7	X	0.22	0.323		0.155	5.4		0.27	355	X	0.10
SZ-3	J1V2J1	1/7/15	3.7		0.70	66.3	X	0.081	0.14	B	0.044	7.7	X	0.062	8.3	X	0.11	14.5	X	0.23	0.209		0.155	4.7		0.29	313	X	0.11
SZ-5	J1V2J3	1/7/15	1.8		0.63	80.4	X	0.073	0.10	B	0.039	4.3	X	0.056	11.1	X	0.48	16.0	X	1.0	0.155	U	0.155	3.2		1.3	384	X	0.096
SZ-6	J1V2J4	1/7/15	2.6		0.66	57.9	X	0.076	0.11	B	0.041	6.5	X	0.058	7.6	X	0.10	12.7	X	0.22	0.249		0.155	3.9		0.27	292	X	0.10
SZ-7	J1V2J5	1/7/15	2.7		0.62	64.7	X	0.072	0.13	B	0.039	7.0	X	0.055	8.3	X	0.094	15.1	X	0.20	0.202		0.155	5.0		0.25	317	X	0.094
SZ-8	J1V2J6	1/7/15	2.7		0.60	45.9	X	0.069	0.13	B	0.037	6.9	X	0.053	8.3	X	0.091	13.8	X	0.20	0.180		0.155	4.1		0.25	310	X	0.091
SZ-9	J1V2J7	1/7/15	4.5		0.61	77.8	X	0.070	0.16	B	0.038	6.1	X	0.053	7.6	X	0.092	14.9	X	0.20	0.286		0.155	6.8		0.25	282	X	0.092
SZ-10	J1V2J8	1/7/15	2.8		0.64	61.8	X	0.074	0.13	B	0.040	6.6	X	0.057	8.1	X	0.098	14.1	X	0.21	0.245		0.155	5.4		0.26	295	X	0.098
SZ-11	J1V2J9	1/7/15	2.8		0.67	72.5	X	0.077	0.11	B	0.042	7.6	X	0.059	9.4	X	0.10	15.7	X	0.22	0.246		0.155	4.1		0.27	355	X	0.10
SZ-12	J1V2K0	1/7/15	3.4		0.70	72.6	X	0.080	0.14	B	0.043	10.3	X	0.061	9.2	X	0.11	17.4	X	0.23	0.272		0.155	5.2		0.29	382	X	0.11

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Hexavalent Chromium mg/kg	Lead mg/kg	Manganese mg/kg
SZ-4	J1V2J2/ J1V2K1	1/7/15	3.1	62.3	0.13	9.4	7.0	13.5	0.190	3.9	287
SZ-1	J1V2H9	1/7/15	2.5	64.5	0.11	7.9	7.5	13.6	0.317	4.4	287
SZ-2	J1V2J0	1/7/15	3.8	66.3	0.11	9.1	9.1	18.7	0.323	5.4	355
SZ-3	J1V2J1	1/7/15	3.7	66.3	0.14	7.7	8.3	14.5	0.209	4.7	313
SZ-5	J1V2J3	1/7/15	1.8	80.4	0.10	4.3	11.1	16.0	0.0775	3.2	384
SZ-6	J1V2J4	1/7/15	2.6	57.9	0.11	6.5	7.6	12.7	0.249	3.9	292
SZ-7	J1V2J5	1/7/15	2.7	64.7	0.13	7.0	8.3	15.1	0.202	5.0	317
SZ-8	J1V2J6	1/7/15	2.7	45.9	0.13	6.9	8.3	13.8	0.180	4.1	310
SZ-9	J1V2J7	1/7/15	4.5	77.8	0.16	6.1	7.6	14.9	0.286	6.8	282
SZ-10	J1V2J8	1/7/15	2.8	61.8	0.13	6.6	8.1	14.1	0.245	5.4	295
SZ-11	J1V2J9	1/7/15	2.8	72.5	0.11	7.6	9.4	15.7	0.246	4.1	355
SZ-12	J1V2K0	1/7/15	3.4	72.6	0.14	10.3	9.2	17.4	0.272	5.2	382

Statistical Computations

	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
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), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	0%	0%	0%	8%	0%	0%
Mean	3.0	66.1	0.13	7.5	8.5	15.0	0.233	4.7	322
Standard deviation	0.72	9.2	0.017	1.6	1.1	1.7	0.0677	0.96	38
95% UCL on mean	3.5	71.7	0.13	8.5	9.1	15.9	0.268	5.2	339
Maximum value	4.5	80.4	0.16	10.3	11.1	18.7	0.323	6.8	384
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection	10.2 GW & River Protection	512 GW & River Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	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 (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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 7 of 30

1 **100-D-86:1 Subsite Statistical Calculations**
2 **Verification Data - Shallow Zone**

3	Sample	Sample	Sample	Mercury			Nickel			Vanadium			Zinc			TPH - Diesel Range EXT			TPH - Diesel Range		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SZ-4	J1V2J2	1/7/15	0.0055	U	0.0055	9.6	X	0.12	48.1	X	0.094	36.1	X	0.40	6700		1000	2800	J	690
6	Duplicate of J1V2J2	J1V2K1	1/7/15	0.010	B	0.0056	11.8	X	0.12	50.0	X	0.089	37.7	X	0.38	5300		1000	2300	J	680
7	SZ-1	J1V2H9	1/7/15	0.0087	B	0.0058	11.1	X	0.13	54.6	X	0.098	43.0	X	0.42	5600		990	2500	J	670
8	SZ-2	J1V2J0	1/7/15	0.0053	U	0.0053	11.7	X	0.12	57.1	X	0.094	49.5	X	0.40	2600	J	1000	960	J	700
9	SZ-3	J1V2J1	1/7/15	0.023		0.0058	10.2	X	0.13	61.6	X	0.10	47.0	X	0.42	8300		1000	3900	J	690
10	SZ-5	J1V2J3	1/7/15	0.0057	U	0.0057	7.2	X	0.12	91.3	X	0.45	45.3	X	0.38	950	U	950	650	U	650
11	SZ-6	J1V2J4	1/7/15	0.011	BM	0.0053	8.8	X	0.12	55.1	X	0.095	39.1	X	0.40	27000		1000	9900		700
12	SZ-7	J1V2J5	1/7/15	0.10		0.0054	9.3	X	0.12	63.5	X	0.089	44.4	X	0.38	12000		1000	4500		700
13	SZ-8	J1V2J6	1/7/15	0.44		0.0058	8.9	X	0.11	60.3	X	0.086	42.3	X	0.36	4200		1000	1800	J	680
14	SZ-9	J1V2J7	1/7/15	0.29		0.0052	8.5	X	0.11	55.5	X	0.087	50.1	X	0.37	21000		1000	8700		690
15	SZ-10	J1V2J8	1/7/15	0.28		0.0057	8.3	X	0.12	66.5	X	0.092	44.6	X	0.39	24000		970	11000		660
16	SZ-11	J1V2J9	1/7/15	0.0054	U	0.0054	10.9	X	0.12	64.2	X	0.095	45.8	X	0.40	1000	U	1000	700	U	700
17	SZ-12	J1V2K0	1/7/15	0.0080	B	0.0053	11.5	X	0.13	61.5	X	0.099	48.5	X	0.42	1100	U	1100	720	U	720

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Mercury	Nickel	Vanadium	Zinc	TPH - Diesel Range EXT	TPH - Diesel Range
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg
21	SZ-4	J1V2J2/ J1V2K1	1/7/15	0.0064	10.7	49.1	36.9	6000	2550
22	SZ-1	J1V2H9	1/7/15	0.0087	11.1	54.6	43.0	5600	2500
23	SZ-2	J1V2J0	1/7/15	0.0027	11.7	57.1	49.5	2600	960
24	SZ-3	J1V2J1	1/7/15	0.023	10.2	61.6	47.0	8300	3900
25	SZ-5	J1V2J3	1/7/15	0.0029	7.2	91.3	45.3	475	325
26	SZ-6	J1V2J4	1/7/15	0.011	8.8	55.1	39.1	27000	9900
27	SZ-7	J1V2J5	1/7/15	0.10	9.3	63.5	44.4	12000	4500
28	SZ-8	J1V2J6	1/7/15	0.44	8.9	60.3	42.3	4200	1800
29	SZ-9	J1V2J7	1/7/15	0.29	8.5	55.5	50.1	21000	8700
30	SZ-10	J1V2J8	1/7/15	0.28	8.3	66.5	44.6	24000	11000
31	SZ-11	J1V2J9	1/7/15	0.0027	10.9	64.2	45.8	500	350
32	SZ-12	J1V2K0	1/7/15	0.0080	11.5	61.5	48.5	550	360

33 **Statistical Computations**

34		Mercury	Nickel	Vanadium	Zinc	TPH - Diesel Range EXT	TPH - Diesel Range
35	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.	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.
36	N	12	12	12	12	12	12
37	% < Detection limit	25%	0%	0%	0%	25%	25%
38	Mean	0.10	9.8	61.7	44.7	9352	3904
39	Standard deviation	0.15	1.4	10.5	4.0	9544	3868
40	95% UCL on mean	0.17	10.6	66.7	47.0	77833	19335
41	Maximum value	0.44	11.8	91.3	50.1	27000	11000
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	200000 ug/kg DE, GW, & River Protection	200000 ug/kg DE, GW, & River Protection
43	**WAC 173-340 3-PART TEST**						
44	95% UCL > Cleanup Limit?	NO	NA	NA	NA	NO	NO
45	> 10% above Cleanup Limit?	NO	NA	NA	NA	NO	NO
46	Any sample > 2X Cleanup Limit?	NO	NA	NA	NA	NO	NO
47	**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 (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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 8 of 30

100-D-86:1 Subsite Maximum Calculations
Verification Data -Shallow Zone

Sample Area	Sample Number	Sample Date	Boron mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Acenaphthene (Method 8310) ug/kg	Q	PQL	Benzo(a)anthracene (Method 8310) ug/kg	Q	PQL	Benzo(a)pyrene (Method 8310) ug/kg	Q	PQL	Benzo(b)fluoranthene (Method 8310) ug/kg	Q	PQL	Benzo(ghi)perylene (Method 8310) ug/kg	Q	PQL	Benzo(k)fluoranthene (Method 8310) ug/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	1.0	B	0.98	0.26	U	0.26	10	U	10	3.3	U	3.3	6.7	U	6.7	4.4	U	4.4	7.6	U	7.6	4.1	U	4.1
Duplicate of J1V2J2	J1V2K1	1/7/15	0.95	B	0.93	0.25	U	0.25	9.7	U	9.7	3.1	U	3.1	6.2	U	6.2	5.9	J	4.1	7.0	U	7.0	3.8	U	3.8
SZ-1	J1V2H9	1/7/15	1.2	B	1.0	0.27	U	0.27	11	U	11	6.8	JX	3.4	9.6	JX	6.8	15	J	4.5	7.7	U	7.7	4.7	JX	4.2
SZ-2	J1V2J0	1/7/15	0.98	U	0.98	0.26	U	0.26	10	U	10	3.3	U	3.3	6.7	U	6.7	4.4	U	4.4	7.5	U	7.5	4.1	U	4.1
SZ-3	J1V2J1	1/7/15	1.1	B	1.0	0.28	U	0.28	11	U	11	3.5	U	3.5	12	JX	6.9	4.6	U	4.6	7.8	U	7.8	4.3	U	4.3
SZ-5	J1V2J3	1/7/15	0.94	U	0.94	0.25	U	0.25	10	U	10	3.2	U	3.2	6.5	U	6.5	4.3	U	4.3	7.3	U	7.3	4.0	U	4.0
SZ-6	J1V2J4	1/7/15	0.99	U	0.99	0.26	U	0.26	11	U	11	3.4	U	3.4	6.8	U	6.8	4.5	U	4.5	7.6	U	7.6	4.2	U	4.2
SZ-7	J1V2J5	1/7/15	0.92	U	0.92	0.25	U	0.25	10	U	10	3.3	U	3.3	9.0	JX	6.6	11	J	4.3	7.4	U	7.4	4.2	J	4.1
SZ-8	J1V2J6	1/7/15	0.89	U	0.89	0.32	B	0.24	10	U	10	3.4	JX	3.2	6.5	U	6.5	4.2	U	4.2	7.3	U	7.3	4.0	U	4.0
SZ-9	J1V2J7	1/7/15	1.1	B	0.90	0.24	U	0.24	9.7	U	9.7	14	J	3.1	17	X	6.2	14	JX	4.1	7.0	U	7.0	6.3	JX	3.8
SZ-10	J1V2J8	1/7/15	0.96	U	0.96	0.25	U	0.25	14	J	9.8	42		3.1	32		6.3	24	X	4.1	14	JX	7.1	11	J	3.9
SZ-11	J1V2J9	1/7/15	0.99	U	0.99	0.26	U	0.26	10	U	10	3.2	U	3.2	6.5	U	6.5	4.2	U	4.2	7.3	U	7.3	4.0	U	4.0
SZ-12	J1V2K0	1/7/15	1.0	U	1.0	0.28	U	0.28	11	U	11	3.4	U	3.4	6.8	U	6.8	4.4	U	4.4	7.6	U	7.6	4.2	U	4.2

3-Part Test Evaluations

	Boron	Molybdenum	Acenaphthene (Method 8310)	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Benzo(k)fluoranthene (Method 8310)
% < Detection limit	67%	92%	92%	67%	58%	58%	92%	67%
Maximum value	1.2	0.32	14	42	32	24	14	11
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	320 GW Protection	8 GW Protection	96,000 ug/kg GW Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48,000 ug/kg GW & River Protection	15 ug/kg GW & River Protection
3-PART TEST								
Maximum > Cleanup Limit?	NO	NO	NO	YES	YES	YES	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	YES	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	YES	YES	NO	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-86:1 Subsite Maximum Calculations
Verification Data -Shallow Zone

Sample Area	Sample Number	Sample Date	Chrysene (Method 8310) ug/kg	Q	PQL	Fluoranthene (Method 8310) ug/kg	Q	PQL	Fluorene (Method 8310) ug/kg	Q	PQL	Indeno(1,2,3-cd)pyrene (Method 8310) ug/kg	Q	PQL	Phenanthrene (Method 8310) ug/kg	Q	PQL	Pyrene (Method 8310) ug/kg	Q	PQL	Aroclor-1254 ug/kg	Q	PQL	Aroclor-1260 ug/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	5.1	U	5.1	14	U	14	5.5	U	5.5	13	U	13	13	U	13	13	U	13	2.7	U	2.7	2.7	U	2.7
Duplicate of J1V2J2	J1V2K1	1/7/15	4.7	U	4.7	13	U	13	5.1	U	5.1	12	U	12	12	U	12	12	U	12	2.7	U	2.7	2.7	U	2.7
SZ-1	J1V2H9	1/7/15	5.2	U	5.2	14	U	14	5.6	U	5.6	13	U	13	13	U	13	13	U	13	2.8	U	2.8	2.8	U	2.8
SZ-2	J1V2J0	1/7/15	5.1	U	5.1	14	U	14	5.5	U	5.5	13	U	13	13	U	13	13	U	13	3.6	J	2.8	2.8	U	2.8
SZ-3	J1V2J1	1/7/15	5.2	U	5.2	14	U	14	5.7	U	5.7	13	U	13	13	U	13	13	U	13	8.5	J	2.8	2.8	U	2.8
SZ-5	J1V2J3	1/7/15	4.9	U	4.9	13	U	13	5.4	U	5.4	12	U	12	12	U	12	12	U	12	2.5	U	2.5	2.5	U	2.5
SZ-6	J1V2J4	1/7/15	5.1	U	5.1	14	U	14	5.6	U	5.6	13	U	13	13	U	13	13	U	13	2.8	U	2.8	2.8	U	2.8
SZ-7	J1V2J5	1/7/15	13	J	5.0	17	J	13	5.4	U	5.4	12	U	12	12	U	12	25	J	12	2.7	U	2.7	13		2.7
SZ-8	J1V2J6	1/7/15	4.9	U	4.9	13	U	13	5.3	U	5.3	12	U	12	12	U	12	12	U	12	9.1	J	2.7	2.7	U	2.7
SZ-9	J1V2J7	1/7/15	21	J	4.7	39	X	13	5.1	U	5.1	12	JX	12	21	J	12	59		12	84		2.8	2.8	U	2.8
SZ-10	J1V2J8	1/7/15	46		4.8	93		13	14	J	5.2	16	JX	12	76		12	110		12	60		2.6	2.6	U	2.6
SZ-11	J1V2J9	1/7/15	4.9	U	4.9	13	U	13	5.3	U	5.3	12	U	12	12	U	12	12	U	12	2.8	U	2.8	2.8	U	2.8
SZ-12	J1V2K0	1/7/15	5.1	U	5.1	14	U	14	5.6	U	5.6	13	U	13	13	U	13	13	U	13	2.8	U	2.8	2.8	U	2.8

3-Part Test Evaluations

	Chrysene (Method 8310)	Fluoranthene (Method 8310)	Fluorene (Method 8310)	Indeno(1,2,3-cd)pyrene (Method 8310)	Phenanthrene (Method 8310)	Pyrene (Method 8310)	Aroclor-1254	Aroclor-1260
% < Detection limit	75%	75%	92%	83%	83%	75%	58%	92%
Maximum value	46	93	14	16	76	110	84	13
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	100 ug/kg River Protection	18,000 ug/kg River Protection	64,000 ug/kg GW Protection	330 ug/kg GW & River Protection	240,000 ug/kg GW Protection	48,000 ug/kg GW & River Protection	17 ug/kg GW & River Protection	17 ug/kg GW & River Protection
3-PART TEST								
Maximum > Cleanup Limit?	NO	NO	NO	NO	NO	NO	YES	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	YES	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	YES	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	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 J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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Date 03/10/15
Sheet No. 9 of 30

100-D-86:1 Subsite Maximum Calculations
Verification Data -Shallow Zone

Sample Area	Sample Number	Sample Date	Anthracene (Method 8270)			Benzo(a)anthracene (Method 8270)			Benzo(a)pyrene (Method 8270)			Benzo(b)fluoranthene (Method 8270)			Benzo(ghi)perylene (Method 8270)			Chrysene (Method 8270)			Fluoranthene (Method 8270)			Indeno(1,2,3-cd)pyrene (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	18	U	18	21	U	21	21	U	21	27	U	27	17	U	17	28	U	28	38	U	38	23	U	23
Duplicate of J1V2J2	J1V2K1	1/7/15	17	U	17	20	U	20	20	U	20	27	U	27	16	U	16	27	U	27	37	U	37	22	U	22
SZ-1	J1V2H9	1/7/15	18	U	18	22	U	22	22	U	22	28	U	28	17	U	17	29	U	29	39	U	39	24	U	24
SZ-2	J1V2J0	1/7/15	18	U	18	21	U	21	21	U	21	28	U	28	17	U	17	29	U	29	39	U	39	24	U	24
SZ-3	J1V2J1	1/7/15	18	U	18	21	U	21	21	U	21	28	U	28	17	U	17	29	U	29	38	U	38	24	U	24
SZ-5	J1V2J3	1/7/15	17	U	17	20	U	20	20	U	20	27	U	27	16	U	16	27	U	27	37	U	37	22	U	22
SZ-6	J1V2J4	1/7/15	18	U	18	21	U	21	21	U	21	28	U	28	17	U	17	28	U	28	38	U	38	23	U	23
SZ-7	J1V2J5	1/7/15	18	U	18	21	U	21	21	U	21	27	U	27	17	U	17	28	U	28	38	U	38	23	U	23
SZ-8	J1V2J6	1/7/15	18	U	18	21	U	21	21	U	21	27	U	27	17	U	17	28	U	28	38	U	38	23	U	23
SZ-9	J1V2J7	1/7/15	20	J	18	57	J	21	53	J	21	53	J	27	29	J	17	68	J	28	120	J	38	28	J	23
SZ-10	J1V2J8	1/7/15	18	U	18	36	J	21	26	J	21	28	U	28	17	J	17	42	J	28	62	J	38	23	U	23
SZ-11	J1V2J9	1/7/15	18	U	18	21	U	21	21	U	21	28	U	28	17	U	17	29	U	29	38	U	38	23	U	23
SZ-12	J1V2K0	1/7/15	18	U	18	21	U	21	21	U	21	27	U	27	17	U	17	28	U	28	38	U	38	23	U	23

3-Part Test Evaluations

	Anthracene (Method 8270)	Benzo(a)anthracene (Method 8270)	Benzo(a)pyrene (Method 8270)	Benzo(b)fluoranthene (Method 8270)	Benzo(ghi)perylene (Method 8270)	Chrysene (Method 8270)	Fluoranthene (Method 8270)	Indeno(1,2,3-cd)pyrene (Method 8270)
% < Detection limit	92%	83%	83%	92%	83%	83%	83%	92%
Maximum value	20	57	53	53	29	68	120	28
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	240,000 ug/kg GW Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48,000 ug/kg GW & River Protection	100 ug/kg River Protection	18,000 ug/kg River Protection	330 ug/kg GW & River Protection
3-PART TEST								
Maximum > Cleanup Limit?	NO	YES	YES	YES	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	YES	YES	YES	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	YES	YES	YES	NO	NO	NO	NO
3-Part Test Compliance?	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-86:1 Subsite Maximum Calculations
Verification Data -Shallow Zone

Sample Area	Sample Number	Sample Date	Phenanthrene (Method 8270)			Pyrene (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	18	U	18	13	U	13
Duplicate of J1V2J2	J1V2K1	1/7/15	17	U	17	12	U	12
SZ-1	J1V2H9	1/7/15	18	U	18	15	J	13
SZ-2	J1V2J0	1/7/15	18	U	18	13	U	13
SZ-3	J1V2J1	1/7/15	18	U	18	13	U	13
SZ-5	J1V2J3	1/7/15	17	U	17	12	U	12
SZ-6	J1V2J4	1/7/15	18	U	18	13	U	13
SZ-7	J1V2J5	1/7/15	18	U	18	29	J	13
SZ-8	J1V2J6	1/7/15	18	U	18	13	U	13
SZ-9	J1V2J7	1/7/15	92	J	18	130	J	13
SZ-10	J1V2J8	1/7/15	33	J	18	67	J	13
SZ-11	J1V2J9	1/7/15	18	U	18	13	U	13
SZ-12	J1V2K0	1/7/15	18	U	18	13	U	13

3-Part Test Evaluations

	Phenanthrene (Method 8270)	Pyrene (Method 8270)
% < Detection limit	83%	67%
Maximum value	92	130
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	240,000 ug/kg GW Protection	48,000 ug/kg GW & River Protection
3-PART TEST		
Maximum > Cleanup Limit?	NO	NO
> 10% above Cleanup Limit?	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

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Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
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100-D-86:1 Subsite Statistical Calculations
Verification Data -Overburden

Sample Area	Sample Number	Sample Date	Cesium-137			Europium-152			Europium-155			Total beta radiostrontium			Uranium-234			Uranium-238		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB-1	J1V2L6	1/6/15	0.332		0.0250	0.207		0.0604	0.0107	U	0.0567	0.385		0.309	0.134		0.0603	0.164		0.0546
Duplicate of J1V2L6	J1V2M8	1/6/15	0.275		0.0248	-0.0199	U	0.0776	0.000267	U	0.0897	0.347		0.267	0.109		0.0552	0.219		0.0372
OB-2	J1V2L7	1/6/15	0.233		0.0198	0.0854	U	0.0534	0.0401	U	0.0378	0.223		0.200	0.0875		0.0595	0.204		0.0708
OB-3	J1V2L8	1/6/15	0.360		0.0200	0.120	U	0.0571	0.0256	U	0.0379	0.206	U	0.231	0.268		0.0428	0.158		0.0428
OB-4	J1V2L9	1/6/15	0.293		0.0347	-0.0309	U	0.0818	0.0605	U	0.0868	0.243		0.242	0.312		0.0645	0.179		0.0405
OB-5	J1V2M0	1/6/15	0.400		0.0330	-0.00934	U	0.0847	0.0291	U	0.0773	0.246		0.240	0.114		0.0522	0.142		0.0577
OB-6	J1V2M1	1/6/15	0.00448	U	0.0288	-0.101	U	0.0775	-0.0107	U	0.0928	0.0131	U	0.260	0.271		0.0609	0.257		0.0410
OB-7	J1V2M2	1/6/15	0.282		0.0222	-0.00101	U	0.0585	0.0285	U	0.0693	0.114	U	0.252	0.197		0.0410	0.151		0.0410
OB-8	J1V2M3	1/6/15	0.435		0.0253	0.00408	U	0.0645	0.0410	U	0.0624	0.709		0.383	0.106		0.0536	0.147		0.0361
OB-9	J1V2M4	1/6/15	0.615		0.0216	-0.00169	U	0.0497	0.0392	U	0.0431	0.338		0.219	0.228		0.0551	0.229		0.0465
OB-10	J1V2M5	1/6/15	0.179		0.0193	0.0246	U	0.0420	0.0331		0.0330	0.263		0.257	0.244		0.0495	0.136		0.0369
OB-11	J1V2M6	1/6/15	0.273		0.0210	0.0141	U	0.0463	0.0122	U	0.0418	0.234		0.227	0.107		0.0362	0.187		0.0362
OB-12	J1V2M7	1/6/15	0.362		0.0321	0.00715	U	0.0843	0.0110	U	0.0743	0.234		0.228	0.110		0.0557	0.124		0.0504

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Europium-152 pCi/g	Europium-155 pCi/g	Total beta radiostrontium pCi/g	Uranium-234 pCi/g	Uranium-238 pCi/g
OB-1	J1V2L6/ J1V2M8	1/6/15	0.304	0.123	0.00548	0.366	0.122	0.192
OB-2	J1V2L7	1/6/15	0.233	0.0267	0.0401	0.223	0.0875	0.204
OB-3	J1V2L8	1/6/15	0.360	0.0286	0.0256	0.116	0.268	0.158
OB-4	J1V2L9	1/6/15	0.293	0.0409	0.0605	0.243	0.312	0.179
OB-5	J1V2M0	1/6/15	0.400	0.0424	0.0291	0.246	0.114	0.142
OB-6	J1V2M1	1/6/15	0.00448	0.0388	-0.0107	0.130	0.271	0.257
OB-7	J1V2M2	1/6/15	0.282	0.0293	0.0285	0.126	0.197	0.151
OB-8	J1V2M3	1/6/15	0.435	0.0323	0.0410	0.709	0.106	0.147
OB-9	J1V2M4	1/6/15	0.615	0.0249	0.0392	0.338	0.228	0.229
OB-10	J1V2M5	1/6/15	0.179	0.0210	0.0331	0.263	0.244	0.136
OB-11	J1V2M6	1/6/15	0.273	0.0232	0.0122	0.234	0.107	0.187
OB-12	J1V2M7	1/6/15	0.362	0.0422	0.0110	0.234	0.110	0.124

Statistical Computations

	Cesium-137	Europium-152	Europium-155	Total beta radiostrontium	Uranium-234	Uranium-238
95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.
N	12	12	12	12	12	12
% < Detection limit	8%	92%	92%	25%	0%	0%
Mean	0.312	0.0394	0.0263	0.269	0.181	0.175
Standard deviation	0.148	0.0274	0.0192	0.159	0.0810	0.0402
Z-statistic	1.64	1.64	1.64	1.64	1.64	1.64
95% UCL on mean	0.382	0.0524	0.0354	0.344	0.219	0.195
Maximum value	0.615	0.207	0.0331	0.709	0.312	0.257

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 11 of 30

1 **100-D-86:1 Subsite Statistical Calculations**

2 **Verification Data -Overburden**

3	Sample	Sample	Sample	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Hexavalent Chromium			Lead			Manganese		
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	mg/kg	Q	PQL
5	OB-1	J1V2L6	1/6/15	2.1		0.62	58.3	X	0.072	0.13	B	0.039	5.8	X	0.055	9.0		0.19	15.0		0.41	0.155	U	0.155	5.1		0.51	304	X	0.095
6	Duplicate of J1V2L6	J1V2M8	1/6/15	2.4		0.62	54.6	X	0.072	0.13	B	0.039	7.4	X	0.055	8.4		0.094	14.1		0.20	0.155	U	0.155	4.8		0.25	316	X	0.094
7	OB-2	J1V2L7	1/6/15	2.7		0.62	64.4	X	0.071	0.16	B	0.039	8.0	X	0.054	8.5		0.094	13.7		0.20	0.213		0.155	5.8		0.25	325	X	0.094
8	OB-3	J1V2L8	1/6/15	2.3		0.60	52.8	X	0.069	0.14	B	0.037	7.5	X	0.053	7.7		0.091	14.0		0.20	0.155	U	0.155	4.7		0.25	270	X	0.091
9	OB-4	J1V2L9	1/6/15	4.2		0.63	71.2	X	0.073	0.16	B	0.039	8.9	X	0.055	8.1		0.096	14.4		0.21	0.155	U	0.155	9.4		0.26	323	X	0.096
10	OB-5	J1V2M0	1/6/15	2.0		0.67	54.3	X	0.077	0.15	B	0.042	7.0	X	0.059	8.4		0.10	13.7		0.22	0.168		0.155	5.0		0.27	309	X	0.10
11	OB-6	J1V2M1	1/6/15	2.1		0.71	56.8	X	0.082	0.11	B	0.044	7.8	X	0.063	6.9		0.11	12.5		0.23	0.155	U	0.155	2.8		0.29	278	X	0.11
12	OB-7	J1V2M2	1/6/15	2.3		0.68	57.3	X	0.079	0.13	B	0.042	6.4	X	0.060	7.6		0.10	12.1		0.22	0.155	U	0.155	4.9		0.28	287	X	0.10
13	OB-8	J1V2M3	1/6/15	2.4		0.63	76.6	X	0.072	0.15	B	0.039	7.4	X	0.055	8.0		0.095	14.3		0.21	0.214		0.155	6.0		0.26	311	X	0.095
14	OB-9	J1V2M4	1/6/15	2.4		0.60	60.0	X	0.069	0.14	B	0.037	7.5	X	0.053	8.3		0.091	13.9		0.20	0.155	U	0.155	5.7		0.25	307	X	0.091
15	OB-10	J1V2M5	1/6/15	2.1		0.68	59.7	X	0.079	0.14	B	0.043	5.8	X	0.060	7.7		0.10	14.1		0.23	0.212		0.155	4.5		0.28	300	X	0.10
16	OB-11	J1V2M6	1/6/15	2.7		0.65	63.5	X	0.075	0.14	B	0.040	5.5	X	0.057	8.6		0.098	12.9		0.21	0.214		0.155	3.9		0.27	331	X	0.098
17	OB-12	J1V2M7	1/6/15	1.9		0.70	69.3	X	0.080	0.16	B	0.043	7.4	X	0.061	8.8		0.11	14.3		0.23	0.169		0.155	5.6		0.29	372	X	0.11

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	OB-1	J1V2L6/ J1V2M8	1/6/15	2.3	56.5	0.13	6.6	8.7	14.6	0.0775	5.0	310
22	OB-2	J1V2L7	1/6/15	2.7	64.4	0.16	8.0	8.5	13.7	0.213	5.8	325
23	OB-3	J1V2L8	1/6/15	2.3	52.8	0.14	7.5	7.7	14.0	0.0775	4.7	270
24	OB-4	J1V2L9	1/6/15	4.2	71.2	0.16	8.9	8.1	14.4	0.0775	9.4	323
25	OB-5	J1V2M0	1/6/15	2.0	54.3	0.15	7.0	8.4	13.7	0.168	5.0	309
26	OB-6	J1V2M1	1/6/15	2.1	56.8	0.11	7.8	6.9	12.5	0.0775	2.8	278
27	OB-7	J1V2M2	1/6/15	2.3	57.3	0.13	6.4	7.6	12.1	0.0775	4.9	287
28	OB-8	J1V2M3	1/6/15	2.4	76.6	0.15	7.4	8.0	14.3	0.214	6.0	311
29	OB-9	J1V2M4	1/6/15	2.4	60.0	0.14	7.5	8.3	13.9	0.0775	5.7	307
30	OB-10	J1V2M5	1/6/15	2.1	59.7	0.14	5.8	7.7	14.1	0.212	4.5	300
31	OB-11	J1V2M6	1/6/15	2.7	63.5	0.14	5.5	8.6	12.9	0.214	3.9	331
32	OB-12	J1V2M7	1/6/15	1.9	69.3	0.16	7.4	8.8	14.3	0.169	5.6	372

33 **Statistical Computations**

34		Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
35	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	0%	50%	0%	0%
38	Mean	2.4	61.9	0.14	7.2	8.1	13.7	0.138	5.3	310
39	Standard deviation	0.61	7.34	0.015	0.95	0.56	0.79	0.0650	1.6	26.9
40	95% UCL on mean	2.7	65.8	0.15	7.7	8.4	14.1	0.169	6.0	325
41	Maximum value	4.2	76.6	0.16	8.9	9.0	15.0	0.214	9.4	372
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection	10.2 GW & River Protection	512 GW & River Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NA	NA
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NA	NA
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NA	NA
47	**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 (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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 12 of 30

1 **100-D-86:1 Subsite Statistical Calculations**

2 **Verification Data -Overburden**

3	Sample	Sample	Sample	Mercury			Nickel			Vanadium			Zinc			TPH - Diesel Range EXT			TPH - Diesel Range			Benzo(a)anthracene (Method 8310)			Benzo(a)pyrene (Method 8310)			Benzo(b)fluoranthene (Method 8310)		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	OB-1	J1V2L6	1/6/15	0.30		0.0054	9.0	X	0.12	63.8		0.18	42.7	X	0.38	6400		1000	3400	J	700	6.6	JX	3.2	11	JX	6.5	9.2	J	4.2
6	Duplicate of J1V2L6	J1V2M8	1/6/15	0.30		0.0052	12.7	X	0.12	61.5		0.089	41.3	X	0.38	13000		1000	6300		710	8.7	JX	3.1	20		6.2	12	JX	4.1
7	OB-2	J1V2L7	1/6/15	0.084		0.0058	9.7	X	0.12	65.3		0.088	46.7	X	0.37	8400		1000	4300		680	26	NX	3.2	16		6.4	16	N	4.2
8	OB-3	J1V2L8	1/6/15	0.35		0.0057	10.9	X	0.11	56.2		0.085	40.6	X	0.36	8500		1000	4100		690	9.7	J	3.2	12	J	6.4	8.5	J	4.2
9	OB-4	J1V2L9	1/6/15	0.011	B	0.0057	11.8	X	0.12	56.6		0.090	43.5	X	0.38	4700		1100	2200	J	720	3.3	U	3.3	6.5	U	6.5	4.3	U	4.3
10	OB-5	J1V2M0	1/6/15	0.11		0.0052	9.5	X	0.12	62.6		0.095	43.8	X	0.40	8100		1000	5300		700	3.3	U	3.3	6.7	U	6.7	4.9	J	4.4
11	OB-6	J1V2M1	1/6/15	0.050		0.0054	10.9	X	0.13	50.0		0.10	35.9	X	0.43	1600	J	1100	900	J	730	3.3	U	3.3	6.7	U	6.7	4.4	U	4.4
12	OB-7	J1V2M2	1/6/15	0.12		0.0056	8.1	X	0.13	56.6		0.097	40.6	X	0.41	6600		1000	3400	J	690	14	J	3.3	17		6.7	11	J	4.4
13	OB-8	J1V2M3	1/6/15	0.22		0.0055	10	X	0.12	62.6		0.090	46.2	X	0.38	22000		990	14000		670	300		3.3	310		6.6	160		4.3
14	OB-9	J1V2M4	1/6/15	0.13		0.0055	9.2	X	0.11	64.5		0.085	45.5	X	0.36	12000		1000	5000		690	14	JX	3.1	30		6.2	22	X	4.1
15	OB-10	J1V2M5	1/6/15	0.070	M	0.0052	7.7	X	0.13	64.5		0.097	43.8	X	0.41	8100		980	4000		670	8.3	JX	3.3	20		6.7	18	X	4.4
16	OB-11	J1V2M6	1/6/15	0.084		0.0055	9.6	X	0.12	53.8		0.092	42.0	X	0.39	8000		1000	3700	J	710	6.0	JX	3.4	12	J	6.7	8.6	JX	4.4
17	OB-12	J1V2M7	1/6/15	0.092		0.0056	9.7	X	0.13	65.5		0.099	47.3	X	0.42	11000		990	5000		670	7.5	J	3.3	8.0	JX	6.6	6.4	JX	4.3

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Mercury	Nickel	Vanadium	Zinc	TPH - Diesel Range EXT	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
21	OB-1	J1V2L6/ J1V2M8	1/6/15	0.30	10.9	62.7	42.0	9700	4850	7.7	16	11
22	OB-2	J1V2L7	1/6/15	0.084	9.7	65.3	46.7	8400	4300	26	16	16
23	OB-3	J1V2L8	1/6/15	0.35	10.9	56.2	40.6	8500	4100	9.7	12	8.5
24	OB-4	J1V2L9	1/6/15	0.011	11.8	56.6	43.5	4700	2200	1.7	3.3	2.2
25	OB-5	J1V2M0	1/6/15	0.11	9.5	62.6	43.8	8100	5300	1.7	3.4	4.9
26	OB-6	J1V2M1	1/6/15	0.050	10.9	50.0	35.9	1600	900	1.7	3.4	2.2
27	OB-7	J1V2M2	1/6/15	0.12	8.1	56.6	40.6	6600	3400	14	17	11
28	OB-8	J1V2M3	1/6/15	0.22	10.0	62.6	46.2	22000	14000	300	310	160
29	OB-9	J1V2M4	1/6/15	0.13	9.2	64.5	45.5	12000	5000	14	30	22
30	OB-10	J1V2M5	1/6/15	0.070	7.7	64.5	43.8	8100	4000	8.3	20	18
31	OB-11	J1V2M6	1/6/15	0.084	9.6	53.8	42.0	8000	3700	6.0	12	8.6
32	OB-12	J1V2M7	1/6/15	0.092	9.7	65.5	47.3	11000	5000	7.5	8.0	6.4

33 **Statistical Computations**

34		Mercury	Nickel	Vanadium	Zinc	TPH - Diesel Range EXT	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)
35	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.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	0%	25%	25%	17%
38	Mean	0.14	9.8	60.1	43.2	9058	4729	33	38	23
39	Standard deviation	0.10	1.2	5.2	3.2	4905	3183	84	86	44
40	95% UCL on mean	0.18	10.5	62.5	45.0	11388	6241	73	78	43
41	Maximum value	0.35	12.7	65.5	47.3	22000	14000	300	310	160
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	200000 ug/kg DE, GW, & River Protection	200000 ug/kg DE, GW, & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	NO	NA	NA	NA	NO	NO	YES	YES	YES
45	> 10% above Cleanup Limit?	NO	NA	NA	NA	NO	NO	YES	YES	YES
46	Any sample > 2X Cleanup Limit?	NO	NA	NA	NA	NO	NO	YES	YES	YES
47	**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 (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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 13 of 30

1 **100-D-86:1 Subsite Statistical Calculations**
2 **Verification Data -Overburden**

3	Sample	Sample	Sample	Benzo(k)fluoranthene (Method 8310)			Chrysene (Method 8310)			Fluoranthene (Method 8310)			Phenanthrene (Method 8310)			Pyrene (Method 8310)			Aroclor-1254			Pyrene (Method 8270)		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	OB-1	J1V2L6	1/6/15	4.2	J	4.0	12	J	4.9	22	J	13	15	J	12	28	J	12	8.0	J	2.7	29	J	12
6	Duplicate of J1V2L6	J1V2M8	1/6/15	6.3	J	3.8	20	J	4.7	33	JX	13	23	J	12	45		12	9.3	J	2.7	31	J	12
7	OB-2	J1V2L7	1/6/15	6.0	JN	3.9	18	J	4.8	44	N	13	18	JN	12	42		12	29		2.6	36	J	12
8	OB-3	J1V2L8	1/6/15	4.0	U	4.0	13	J	4.9	24	J	13	12	U	12	30	J	12	29		2.6	21	J	12
9	OB-4	J1V2L9	1/6/15	4.0	U	4.0	4.9	U	4.9	13	U	13	12	U	12	12	U	12	2.6	U	2.6	12	U	12
10	OB-5	J1V2M0	1/6/15	4.1	U	4.1	6.1	JX	5.0	14	U	14	12	U	12	12	U	12	7.9	J	2.7	22	J	12
11	OB-6	J1V2M1	1/6/15	4.1	U	4.1	5.1	U	5.1	14	U	14	13	U	13	13	U	13	2.7	U	2.7	13	U	13
12	OB-7	J1V2M2	1/6/15	5.3	J	4.1	16	J	5.1	35	J	14	21	J	13	42		13	27		2.6	24	J	12
13	OB-8	J1V2M3	1/6/15	81		4.0	320		5.0	520		13	240		12	690		12	64		2.6	1300		12
14	OB-9	J1V2M4	1/6/15	11	JX	3.8	30	J	4.7	65		13	44		12	80		12	2.7	U	2.7	62	J	12
15	OB-10	J1V2M5	1/6/15	8.0	J	4.1	21	J	5.1	25	J	14	13	U	13	34	J	13	2.7	U	2.7	39	J	12
16	OB-11	J1V2M6	1/6/15	4.1	U	4.1	17	J	5.1	27	JX	14	16	J	13	36	J	13	19		2.7	25	J	13
17	OB-12	J1V2M7	1/6/15	4.0	U	4.0	9.6	JX	5.0	18	J	13	12	U	12	21	J	12	2.6	U	2.6	26	J	12

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Benzo(k)fluoranthene (Method 8310)	Chrysene (Method 8310)	Fluoranthene (Method 8310)	Phenanthrene (Method 8310)	Pyrene (Method 8310)	Aroclor-1254	Pyrene (Method 8270)
20	Area	Number	Date	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
21	OB-1	J1V2L6/ J1V2M8	1/6/15	5.3	16	28	19	37	8.7	30
22	OB-2	J1V2L7	1/6/15	6.0	18	44	18	42	29	36
23	OB-3	J1V2L8	1/6/15	2.0	13	24	6.0	30	29	21
24	OB-4	J1V2L9	1/6/15	2.0	2.5	6.5	6.0	6.0	1.3	6
25	OB-5	J1V2M0	1/6/15	2.1	6.1	7.0	6.0	6.0	7.9	22
26	OB-6	J1V2M1	1/6/15	2.1	2.6	7.0	6.5	6.5	1.4	7
27	OB-7	J1V2M2	1/6/15	5.3	16	35	21	42	27	24
28	OB-8	J1V2M3	1/6/15	81	320	520	240	690	64	1300
29	OB-9	J1V2M4	1/6/15	11	30	65	44	80	1.4	62
30	OB-10	J1V2M5	1/6/15	8.0	21	25	6.5	34	1.4	39
31	OB-11	J1V2M6	1/6/15	2.1	17	27	16	36	19	25
32	OB-12	J1V2M7	1/6/15	2.0	9.6	18	6.0	21	1.3	26

33 **Statistical Computations**

34		Benzo(k)fluoranthene (Method 8310)	Chrysene (Method 8310)	Fluoranthene (Method 8310)	Phenanthrene (Method 8310)	Pyrene (Method 8310)	Aroclor-1254	Pyrene (Method 8270)
35	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12
37	% < Detection limit	50%	17%	25%	50%	25%	42%	17%
38	Mean	11	39	67	33	86	16	133
39	Standard deviation	22	89	144	66	191	19	368
40	95% UCL on mean	21	81	135	64	177	25	308
41	Maximum value	81	320	520	240	690	64	1300
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	15 ug/kg GW & River Protection	100 ug/kg River Protection	18,000 ug/kg River Protection	240,000 ug/kg GW Protection	48,000 ug/kg GW Protection	17 ug/kg GW & River Protection	48,000 ug/kg GW Protection
43	**WAC 173-340 3-PART TEST**							
44	95% UCL > Cleanup Limit?	YES	NO	NO	NO	NO	YES	NO
45	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	YES	NO
46	Any sample > 2X Cleanup Limit?	YES	YES	NO	NO	NO	YES	NO
47	**WAC 173-340 Compliance?**	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	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 J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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100-D-86:1 Subsite Maximum Calculations
Verification Data -Overburden

Sample Area	Sample Number	Sample Date	Molybdenum			Acenaphthene (Method 8310)			Benzo(ghi)perylene (Method 8310)			Dibenz[a,h]anthracene (Method 8310)			Fluorene (Method 8310)			Indeno(1,2,3-cd)pyrene (Method 8310)			Aroclor-1260			Acenaphthene (Method 8270)			Acenaphthylene (Method 8270)			Anthracene (Method 8270)		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-1	J1V2L6	1/6/15	0.25	U	0.25	10	U	10	7.3	U	7.3	11	UN	11	5.3	U	5.3	12	U	12	2.7	U	2.7	10	U	10	17	U	17	17	U	17
Duplicate of J1V2L6	J1V2M8	1/6/15	0.24	U	0.24	9.7	U	9.7	6.9	U	6.9	11	UN	11	5.1	U	5.1	12	U	12	2.7	U	2.7	10	U	10	17	U	17	17	U	17
OB-2	J1V2L7	1/6/15	0.27	B	0.24	10	UN	10	7.2	U	7.2	11	UN	11	5.3	U	5.3	12	UN	12	2.6	U	2.6	11	J	10	17	U	17	17	J	17
OB-3	J1V2L8	1/6/15	0.24	U	0.24	10	U	10	7.2	U	7.2	11	UN	11	5.3	U	5.3	12	U	12	2.6	UN	2.6	10	U	10	17	U	17	17	U	17
OB-4	J1V2L9	1/6/15	0.25	U	0.25	10	U	10	7.3	U	7.3	11	UN	11	5.4	U	5.4	12	U	12	5.0	J	2.6	10	U	10	17	U	17	17	U	17
OB-5	J1V2M0	1/6/15	0.26	U	0.26	10	U	10	7.5	U	7.5	11	UN	11	5.5	U	5.5	12	U	12	2.7	U	2.7	10	U	10	16	U	16	16	U	16
OB-6	J1V2M1	1/6/15	0.28	U	0.28	10	U	10	7.5	U	7.5	12	UN	12	5.5	U	5.5	13	U	13	2.7	U	2.7	11	U	11	18	U	18	18	U	18
OB-7	J1V2M2	1/6/15	0.27	U	0.27	10	U	10	7.5	U	7.5	12	UN	12	5.5	U	5.5	13	U	13	2.6	U	2.6	10	U	10	17	U	17	17	U	17
OB-8	J1V2M3	1/6/15	0.25	U	0.25	45	J	10	150		7.4	41	XN	11	44		5.4	160		12	2.6	U	2.6	92	J	10	18	J	17	340		17
OB-9	J1V2M4	1/6/15	0.24	U	0.24	9.7	U	9.7	13	JX	7.0	11	UN	11	5.1	U	5.1	12	U	12	65		2.7	11	U	11	17	U	17	17	U	17
OB-10	J1V2M5	1/6/15	0.27	U	0.27	10	U	10	7.5	U	7.5	12	UN	12	5.5	U	5.5	13	U	13	12		2.7	10	U	10	17	U	17	17	U	17
OB-11	J1V2M6	1/6/15	0.26	U	0.26	11	U	11	7.6	U	7.6	12	UN	12	5.6	U	5.6	13	U	13	2.7	U	2.7	11	U	11	18	U	18	18	U	18
OB-12	J1V2M7	1/6/15	0.27	U	0.27	10	U	10	7.4	U	7.4	11	UN	11	5.4	U	5.4	12	U	12	19		2.6	11	U	11	17	U	17	17	U	17

3-Part Test Evaluations

	Molybdenum	Acenaphthene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Dibenz[a,h]anthracene (Method 8310)	Fluorene (Method 8310)	Indeno(1,2,3-cd)pyrene (Method 8310)	Aroclor-1260	Acenaphthene (Method 8270)	Acenaphthylene (Method 8270)	Anthracene (Method 8270)
% < Detection limit	92%	92%	83%	92%	92%	92%	67%	83%	92%	83%
Maximum value	0.27	45	150	41	44	160	65	92	18	340
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	8 GW Protection	96,000 ug/kg GW Protection	48,000 ug/kg GW & River Protection	30 ug/kg GW Protection	64,000 ug/kg GW Protection	330 ug/kg GW & River Protection	17 ug/kg GW & River Protection	96,000 ug/kg GW Protection	96,000 ug/kg GW Protection	240,000 ug/kg GW Protection
3-PART TEST										
Maximum > Cleanup Limit?	NO	NO	NO	YES	NO	NO	YES	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-86:1 Subsite Maximum Calculations
Verification Data -Overburden

Sample Area	Sample Number	Sample Date	Benzo(a)anthracene (Method 8270)			Benzo(a)pyrene (Method 8270)			Benzo(b)fluoranthene (Method 8270)			Benzo(ghi)perylene (Method 8270)			Bis(2-ethylhexyl) phthalate (Method 8270)			Carbazole (Method 8270)			Chrysene (Method 8270)			Di-n-butylphthalate (Method 8270)			Dibenz[a,h]anthracene (Method 8270)			Dibenzofuran (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-1	J1V2L6	1/6/15	20	U	20	20	U	20	26	U	26	16	U	16	120	J	45	35	U	35	27	U	27	28	U	28	19	U	19	20	U	20
Duplicate of J1V2L6	J1V2M8	1/6/15	20	J	20	20	U	20	26	U	26	16	U	16	46	U	46	36	U	36	27	U	27	29	U	29	19	U	19	20	U	20
OB-2	J1V2L7	1/6/15	28	J	20	24	J	20	27	J	26	20	J	16	140	J	46	36	U	36	28	J	27	29	U	29	19	U	19	20	U	20
OB-3	J1V2L8	1/6/15	20	U	20	20	U	20	26	U	26	16	U	16	46	U	46	36	U	36	27	U	27	38	J	29	19	U	19	20	U	20
OB-4	J1V2L9	1/6/15	20	U	20	20	U	20	26	U	26	16	U	16	46	U	46	36	U	36	27	U	27	29	U	29	19	U	19	20	U	20
OB-5	J1V2M0	1/6/15	19	U	19	19	U	19	25	U	25	15	U	15	45	U	45	35	U	35	26	U	26	28	U	28	18	U	18	19	U	19
OB-6	J1V2M1	1/6/15	21	U	21	21	U	21	28	U	28	17	U	17	49	U	49	38	U	38	29	U	29	31	U	31	20	U	20	21	U	21
OB-7	J1V2M2	1/6/15	20	U	20	20	U	20	26	U	26	17	J	16	46	U	46	36	U	36	27	U	27	29	U	29	19	U	19	20	U	20
OB-8	J1V2M3	1/6/15	600		20	20	U	20	820	K	26	220	J	16	45	U	45	87	J	35	650		26	28	U	28	65	J	19	61	J	20
OB-9	J1V2M4	1/6/15	33	J	20	28	J	20	27	U	27	16	U	16	47	U	47	37	U	37	32	J	28	30	U	30	19	U	19	20	U	20
OB-10	J1V2M5	1/6/15	26	J	20	20	U	20	27	U	27	16	U	16	47	U	47	37	U	37	27	U	27	29	U	29	19	U	19	20	U	20
OB-11	J1V2M6	1/6/15	21	U	21	21	U	21	27	U	27	17	U	17	48	U	48	37	U	37	28	U	28	30	U	30	20	U	20	21	U	21
OB-12	J1V2M7	1/6/15	20	U	20	20	U	20	27	U	27	16	U	16	200	J	47	37	U	37	28	U	28	30	U	30	19	U	19	20	U	20

3-Part Test Evaluations

	Benzo(a)anthracene (Method 8270)	Benzo(a)pyrene (Method 8270)	Benzo(b)fluoranthene (Method 8270)	Benzo(ghi)perylene (Method 8270)	Bis(2-ethylhexyl) phthalate (Method 8270)	Carbazole (Method 8270)	Chrysene (Method 8270)	Di-n-butylphthalate (Method 8270)	Dibenz[a,h]anthracene (Method 8270)	Dibenzofuran (Method 8270)
% < Detection limit	58%	83%	83%	75%	75%	92%	75%	92%	92%	92%
Maximum value	600	28	820	220	200	87	650	38	65	61
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48,000 ug/kg GW & River Protection	360 ug/kg River Protection	438 ug/kg GW Protection	100 ug/kg River Protection	160,000 ug/kg GW Protection	30 ug/kg GW and River Protection	3200 ug/kg GW Protection
3-PART TEST										
Maximum > Cleanup Limit?	YES	YES	YES	NO	NO	NO	YES	NO	YES	NO
> 10% above Cleanup Limit?	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	YES	NO	YES	NO	NO	NO	YES	NO	YES	NO
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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	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	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 J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
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100-D-86:1 Subsite Maximum Calculations
Verification Data -Overburden

Sample Area	Sample Number	Sample Date	Fluoranthene (Method 8270)			Fluorene (Method 8270)			Indeno(1,2,3-cd)pyrene (Method 8270)			Phenanthrene (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-1	J1V2L6	1/6/15	35	U	35	18	U	18	22	U	22	19	J	17
Duplicate of J1V2L6	J1V2M8	1/6/15	36	U	36	18	U	18	22	U	22	17	U	17
OB-2	J1V2L7	1/6/15	36	U	36	18	U	18	22	U	22	25	J	17
OB-3	J1V2L8	1/6/15	36	U	36	18	U	18	22	U	22	17	U	17
OB-4	J1V2L9	1/6/15	36	U	36	18	U	18	22	U	22	17	U	17
OB-5	J1V2M0	1/6/15	35	U	35	17	U	17	21	U	21	16	U	16
OB-6	J1V2M1	1/6/15	38	U	38	19	U	19	23	U	23	18	U	18
OB-7	J1V2M2	1/6/15	36	U	36	18	U	18	22	U	22	17	U	17
OB-8	J1V2M3	1/6/15	1400		35	150	J	18	240	J	22	1200		17
OB-9	J1V2M4	1/6/15	58	J	37	18	U	18	23	U	23	33	J	17
OB-10	J1V2M5	1/6/15	37	U	37	18	U	18	22	U	22	24	J	17
OB-11	J1V2M6	1/6/15	37	U	37	19	U	19	23	U	23	18	U	18
OB-12	J1V2M7	1/6/15	37	U	37	18	U	18	22	U	22	17	U	17

3-Part Test Evaluations

	Fluoranthene (Method 8270)	Fluorene (Method 8270)	Indeno(1,2,3-cd)pyrene (Method 8270)	Phenanthrene (Method 8270)
% < Detection limit	83%	92%	92%	58%
Maximum value	1400	150	240	1200
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	18,000 ug/kg River Protection	64,000 ug/kg GW Protection	330 ug/kg GW & River Protection	240,000 ug/kg GW Protection
3-PART TEST				
Maximum > Cleanup Limit?	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
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100-D-86:1 Subsite Statistical Calculations

Verification Data - Deep Zone

Sample Area	Sample Number	Sample Date	Cesium-137			Total beta radiostrontium			Uranium-234			Uranium-238		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
DZ-5	J1V2K7	1/7/15	0.0141	U	0.0180	0.230	U	0.406	0.118		0.0652	0.228	J	0.0631
Duplicate of J1V2K7	J1V2L5	1/7/15	0.0222	U	0.0278	0.390		0.388	0.286	J	0.0619	0.251	J	0.0637
DZ-1	J1V2K3	1/7/15	1.04		0.0260	0.122	U	0.408	0.186		0.0943	0.166	J	0.0818
DZ-2	J1V2K4	1/7/15	0.00438	U	0.0252	0.0304	U	0.363	0.146		0.0653	0.230	J	0.0499
DZ-3	J1V2K5	1/7/15	-0.00885	U	0.0174	0.0568	U	0.441	0.169		0.0928	0.212	J	0.0753
DZ-4	J1V2K6	1/7/15	-0.00137	U	0.0191	0.307	U	0.450	0.150		0.0654	0.177	J	0.0514
DZ-6	J1V2K8	1/7/15	0.00176	U	0.0232	0.0332	U	0.376	0.262		0.0954	0.334	J	0.0954
DZ-7	J1V2K9	1/7/15	0.00832	U	0.0258	0.0245	U	0.404	0.0888	U	0.117	0.124	J	0.102
DZ-8	J1V2L0	1/7/15	0.00578	U	0.0205	0.0893	U	0.369	0.0985		0.0633	0.189	J	0.0511
DZ-9	J1V2L1	1/7/15	-0.000825	U	0.0182	0.00978	U	0.423	0.220		0.0687	0.220	J	0.0706
DZ-10	J1V2L2	1/7/15	0.00199	U	0.0212	0.0919	U	0.372	0.176		0.0954	0.167	J	0.0855
DZ-11	J1V2L3	1/7/15	0.0714		0.0240	0.854		0.358	0.176		0.106	0.156	J	0.0864
DZ-12	J1V2L4	1/7/15	-0.00278	U	0.0183	0.150	U	0.388	0.149		0.0582	0.151	J	0.0470

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Total beta radiostrontium pCi/g	Uranium-234 pCi/g	Uranium-238 pCi/g
DZ-5	J1V2K7/ J1V2L5	1/7/15	0.0182	0.297	0.202	0.240
DZ-1	J1V2K3	1/7/15	1.04	0.204	0.186	0.166
DZ-2	J1V2K4	1/7/15	0.00438	0.182	0.146	0.230
DZ-3	J1V2K5	1/7/15	-0.00885	0.221	0.169	0.212
DZ-4	J1V2K6	1/7/15	-0.00137	0.225	0.150	0.177
DZ-6	J1V2K8	1/7/15	0.00176	0.188	0.262	0.334
DZ-7	J1V2K9	1/7/15	0.00832	0.202	0.0888	0.124
DZ-8	J1V2L0	1/7/15	0.00578	0.185	0.0985	0.189
DZ-9	J1V2L1	1/7/15	-0.000825	0.212	0.220	0.220
DZ-10	J1V2L2	1/7/15	0.00199	0.186	0.176	0.167
DZ-11	J1V2L3	1/7/15	0.0714	0.854	0.176	0.156
DZ-12	J1V2L4	1/7/15	-0.00278	0.194	0.149	0.151

Statistical Computations

	Cesium-137	Total beta radiostrontium	Uranium-234	Uranium-238
95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.	Radionuclide data set. Use nonparametric z-statistic.
N	12	12	12	12
% < Detection limit	83%	83%	8%	0%
Mean	0.0948	0.262	0.169	0.197
Standard deviation	0.298	0.189	0.0481	0.0555
Z-statistic	1.64	1.64	1.64	1.64
95% UCL on mean	0.237	0.352	0.191	0.223
Maximum value	1.04	0.854	0.286	0.334

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100-D-86:1 Subsite Statistical Calculations

Verification Data - Deep Zone

Sample Area	Sample Number	Sample Date	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Lead			Manganese			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	1.5	J	0.59	63.1	X	0.068	0.11	B	0.037	4.3	X	0.052	9.7	X	0.18	13.1		0.39	2.3		0.48	295	X	0.089	6.3	X	0.11
Duplicate of J1V2K7	J1V2L5	1/7/15	1.6	J	0.61	66.8	X	0.070	0.10	B	0.038	3.6	X	0.054	9.9	X	0.18	14.1		0.40	2.7		0.50	300	X	0.092	8.0	X	0.11
DZ-1	J1V2K3	1/7/15	1.5	NJ	0.59	64.4	X	0.068	0.11	B	0.037	3.4	X	0.052	9.6	X	0.18	14.0		0.39	2.4		0.48	295	X	0.089	6.4	X	0.11
DZ-2	J1V2K4	1/7/15	1.5	J	0.61	53.3	X	0.070	0.11	B	0.038	3.6	X	0.054	9.7	X	0.19	14.8		0.40	3.0		0.50	302	X	0.093	6.8	X	0.11
DZ-3	J1V2K5	1/7/15	1.4	J	0.67	72.1	X	0.077	0.13	B	0.041	3.8	X	0.059	10.1	X	0.20	15.0		0.44	2.7		0.54	315	X	0.10	8.0	X	0.12
DZ-4	J1V2K6	1/7/15	1.6	J	0.61	66.0	X	0.071	0.11	B	0.038	3.9	X	0.054	9.9	X	0.19	14.2		0.40	2.6		0.50	306	X	0.093	7.0	X	0.11
DZ-6	J1V2K8	1/7/15	2.1	J	0.68	213	X	0.078	0.12	B	0.042	3.7	X	0.060	10.3	X	0.21	14.4		0.45	3.0		0.56	306	X	0.10	8.1	X	0.13
DZ-7	J1V2K9	1/7/15	1.8	J	0.64	58.5	X	0.073	0.12	B	0.040	3.9	X	0.056	9.2	X	0.19	13.1		0.42	2.6		0.52	289	X	0.096	6.8	X	0.12
DZ-8	J1V2L0	1/7/15	1.9	J	0.59	59.2	X	0.068	0.11	B	0.037	4.2	X	0.052	8.8	X	0.18	14.0		0.39	3.2		0.48	305	X	0.089	6.8	X	0.11
DZ-9	J1V2L1	1/7/15	1.6	J	0.61	58.0	X	0.070	0.11	B	0.038	3.9	X	0.054	9.4	X	0.18	12.7		0.40	2.6		0.50	299	X	0.092	8.5	X	0.11
DZ-10	J1V2L2	1/7/15	1.4	J	0.63	63.9	X	0.073	0.10	B	0.039	3.7	X	0.055	9.9	X	0.19	14.0		0.41	2.5		0.52	285	X	0.096	8.3	X	0.12
DZ-11	J1V2L3	1/7/15	2.8	J	0.62	58.5	X	0.072	0.12	B	0.039	6.7	X	0.055	7.9	X	0.095	13.3		0.21	6.2		0.26	289	X	0.095	8.9	X	0.12
DZ-12	J1V2L4	1/7/15	2.4	J	0.69	61.2	X	0.079	0.10	B	0.043	6.2	X	0.061	7.2	X	0.10	12.2		0.23	4.1		0.28	283	X	0.10	9.0	X	0.13

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Lead mg/kg	Manganese mg/kg	Nickel mg/kg
DZ-5	J1V2K7/ J1V2L5	1/7/15	1.6	65.0	0.11	4.0	9.8	13.6	2.5	298	7.2
DZ-1	J1V2K3	1/7/15	1.5	64.4	0.11	3.4	9.6	14.0	2.4	295	6.4
DZ-2	J1V2K4	1/7/15	1.5	53.3	0.11	3.6	9.7	14.8	3.0	302	6.8
DZ-3	J1V2K5	1/7/15	1.4	72.1	0.13	3.8	10.1	15.0	2.7	315	8.0
DZ-4	J1V2K6	1/7/15	1.6	66.0	0.11	3.9	9.9	14.2	2.6	306	7.0
DZ-6	J1V2K8	1/7/15	2.1	213	0.12	3.7	10.3	14.4	3.0	306	8.1
DZ-7	J1V2K9	1/7/15	1.8	58.5	0.12	3.9	9.2	13.1	2.6	289	6.8
DZ-8	J1V2L0	1/7/15	1.9	59.2	0.11	4.2	8.8	14.0	3.2	305	6.8
DZ-9	J1V2L1	1/7/15	1.6	58.0	0.11	3.9	9.4	12.7	2.6	299	8.5
DZ-10	J1V2L2	1/7/15	1.4	63.9	0.10	3.7	9.9	14.0	2.5	285	8.3
DZ-11	J1V2L3	1/7/15	2.8	58.5	0.12	6.7	7.9	13.3	6.2	289	8.9
DZ-12	J1V2L4	1/7/15	2.4	61.2	0.10	6.2	7.2	12.2	4.1	283	9.0

Statistical Computations

	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), 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.	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.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mean	1.7	74.4	0.11	4.2	9.3	13.8	3.1	298	7.7
Standard deviation	0.36	43.9	0.0089	1.1	0.93	0.83	1.1	9.8	1.0
95% UCL on mean	2.0	95.3	0.12	4.7	9.8	14.2	3.6	303	8.2
Maximum value	2.8	213	0.13	6.7	10.3	15.0	6.2	315	9.0
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	10.2 GW & River Protection	512 GW & River Protection	19.1 GW Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA
WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	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 mg/kg) the WAC 173-340 3-part test is not required.

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100-D-86:1 Subsite Statistical Calculations

Verification Data - Deep Zone

Sample Area	Sample Number	Sample Date	Vanadium mg/kg	Vanadium Q	Vanadium PQL	Zinc mg/kg	Zinc Q	Zinc PQL
DZ-5	J1V2K7	1/7/15	82.0		0.17	42.8	JX	0.36
Duplicate of J1V2K7	J1V2L5	1/7/15	92.4		0.17	45.4	JX	0.37
DZ-1	J1V2K3	1/7/15	81.1		0.17	45.1	JNX	0.36
DZ-2	J1V2K4	1/7/15	80.7		0.17	44.1	JX	0.37
DZ-3	J1V2K5	1/7/15	85.9		0.19	47.5	JX	0.40
DZ-4	J1V2K6	1/7/15	87.6		0.17	46.0	JX	0.37
DZ-6	J1V2K8	1/7/15	88.6		0.19	46.4	JX	0.41
DZ-7	J1V2K9	1/7/15	86.9		0.18	44.6	JX	0.38
DZ-8	J1V2L0	1/7/15	72.2		0.17	42.4	JX	0.36
DZ-9	J1V2L1	1/7/15	88.2		0.17	43.6	JX	0.37
DZ-10	J1V2L2	1/7/15	87.0		0.18	41.9	JX	0.38
DZ-11	J1V2L3	1/7/15	61.6		0.089	43.2	JX	0.38
DZ-12	J1V2L4	1/7/15	52.8		0.098	37.4	JX	0.42

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Vanadium mg/kg			Zinc mg/kg		
DZ-5	J1V2K7/ J1V2L5	1/7/15	87.2			44.1		
DZ-1	J1V2K3	1/7/15	81.1			45.1		
DZ-2	J1V2K4	1/7/15	80.7			44.1		
DZ-3	J1V2K5	1/7/15	85.9			47.5		
DZ-4	J1V2K6	1/7/15	87.6			46.0		
DZ-6	J1V2K8	1/7/15	88.6			46.4		
DZ-7	J1V2K9	1/7/15	86.9			44.6		
DZ-8	J1V2L0	1/7/15	72.2			42.4		
DZ-9	J1V2L1	1/7/15	88.2			43.6		
DZ-10	J1V2L2	1/7/15	87.0			41.9		
DZ-11	J1V2L3	1/7/15	61.6			43.2		
DZ-12	J1V2L4	1/7/15	52.8			37.4		

Statistical Computations

	Vanadium	Zinc
95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
N	12	12
% < Detection limit	0%	0%
Mean	80.0	43.9
Standard deviation	11.8	2.6
95% UCL on mean	85.6	45.1
Maximum value	92.4	47.5
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	85.1 GW Protection	67.8 River 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 (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.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

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100-D-86:1 Subsite Maximum Calculations
Verification Data - Deep Zone

Sample Area	Sample Number	Sample Date	Hexavalent Chromium mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	TPH - Diesel Range EXT ug/kg	Q	PQL	TPH - Diesel Range ug/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	0.155	U	0.155	0.0053	U	0.0053	1000	U	1000	690	U	690
Duplicate of J1V2K7	J1V2L5	1/7/15	0.155	U	0.155	0.0054	U	0.0054	970	U	970	660	U	660
DZ-1	J1V2K3	1/7/15	0.155	U	0.155	0.0057	U	0.0057	1000	U	1000	710	U	710
DZ-2	J1V2K4	1/7/15	0.230		0.155	0.0050	U	0.0050	1000	U	1000	690	U	690
DZ-3	J1V2K5	1/7/15	0.155	U	0.155	0.015	B	0.0057	1000	U	1000	710	U	710
DZ-4	J1V2K6	1/7/15	0.155	U	0.155	0.0051	U	0.0051	1000	U	1000	690	U	690
DZ-6	J1V2K8	1/7/15	0.155	U	0.155	0.0054	U	0.0054	1000	U	1000	690	U	690
DZ-7	J1V2K9	1/7/15	0.155	U	0.155	0.0057	U	0.0057	990	U	990	670	U	670
DZ-8	J1V2L0	1/7/15	0.194		0.155	0.0056	U	0.0056	980	U	980	660	U	660
DZ-9	J1V2L1	1/7/15	0.155	U	0.155	0.0053	U	0.0053	1000	U	1000	710	U	710
DZ-10	J1V2L2	1/7/15	0.155	U	0.155	0.0051	U	0.0051	1000	U	1000	700	U	700
DZ-11	J1V2L3	1/7/15	0.155	U	0.155	0.30		0.0054	22000		1100	11000		720
DZ-12	J1V2L4	1/7/15	0.155	U	0.155	0.061		0.0053	12000		1100	4700		730

Sample Area	Benzo(a)anthracene (Method 8310) ug/kg	Q	PQL	Benzo(a)pyrene (Method 8310) ug/kg	Q	PQL	Benzo(b)fluoranthene (Method 8310) ug/kg	Q	PQL	Benzo(ghi)perylene (Method 8310) ug/kg	Q	PQL	Benzo(k)fluoranthene (Method 8310) ug/kg	Q	PQL	Chrysene (Method 8310) ug/kg	Q	PQL
DZ-5	3.3	U	3.3	6.6	U	6.6	4.3	U	4.3	7.4	U	7.4	4.0	UN	4.0	5.0	U	5.0
Duplicate of J1V2K7	3.2	U	3.2	6.4	U	6.4	4.2	UN	4.2	7.2	U	7.2	4.0	UN	4.0	4.9	U	4.9
DZ-1	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	7.2	U	7.2	3.9	UN	3.9	4.8	U	4.8
DZ-2	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	7.0	U	7.0	3.8	UN	3.8	4.7	U	4.7
DZ-3	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	7.0	U	7.0	3.8	UN	3.8	4.7	U	4.7
DZ-4	3.3	U	3.3	6.6	U	6.6	4.3	U	4.3	7.4	U	7.4	4.0	UN	4.0	5.0	U	5.0
DZ-6	3.2	U	3.2	6.5	U	6.5	4.3	U	4.3	7.3	U	7.3	4.0	UN	4.0	4.9	U	4.9
DZ-7	3.1	U	3.1	6.3	U	6.3	4.1	U	4.1	7.1	U	7.1	3.9	UN	3.9	4.8	U	4.8
DZ-8	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	7.1	U	7.1	3.9	UN	3.9	4.8	U	4.8
DZ-9	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	7.2	U	7.2	3.9	UN	3.9	4.8	U	4.8
DZ-10	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	7.0	U	7.0	3.8	UN	3.8	4.7	U	4.7
DZ-11	24	X	3.2	40		6.5	24	X	4.3	30		7.3	8.6	JXN	4.0	28	JX	4.9
DZ-12	3.3	U	3.3	7.7	JX	6.7	5.3	J	4.4	7.5	U	7.5	4.1	UN	4.1	7.1	J	5.1

3-Part Test Evaluations

	Hexavalent Chromium	Mercury	TPH - Diesel Range EXT	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Benzo(k)fluoranthene (Method 8310)	Chrysene (Method 8310)
% < Detection limit	83%	75%	83%	83%	92%	83%	83%	92%	92%	83%
Maximum value	0.230	0.30	22000	11000	24	40	24	30	8.6	28
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	2 River Protection	0.33 GW and River Protection	200,000 ug/kg DE, GW, and River Protection	200,000 ug/kg DE, GW, and River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48,000 ug/kg GW & River Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection
3-PART TEST										
Maximum > Cleanup Limit?	NO	NA	NO	NO	YES	YES	YES	NO	NO	NO
> 10% above Cleanup Limit?	NO	NA	NO	NO	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NA	NO	NO	NO	YES	NO	NO	NO	NO
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.	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-86:1 Subsite Maximum Calculations
Verification Data - Deep Zone

Sample Area	Sample Number	Sample Date	Fluoranthene (Method 8310) ug/kg	Q	PQL	Indeno(1,2,3-cd)pyrene (Method 8310) ug/kg	Q	PQL	Phenanthrene (Method 8310) ug/kg	Q	PQL	Pyrene (Method 8310) ug/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
Duplicate of J1V2K7	J1V2L5	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-1	J1V2K3	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-2	J1V2K4	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-3	J1V2K5	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-4	J1V2K6	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-6	J1V2K8	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-7	J1V2K9	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-8	J1V2L0	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-9	J1V2L1	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-10	J1V2L2	1/7/15	13	U	13	12	U	12	12	U	12	12	U	12
DZ-11	J1V2L3	1/7/15	60	X	13	19	JX	12	37	J	12	74		12
DZ-12	J1V2L4	1/7/15	17	J	14	13	U	13	13	U	13	16	J	13

Sample Area	Aroclor-1254 ug/kg	Q	PQL	Benzo(a)anthracene (Method 8270) ug/kg	Q	PQL	Benzo(a)pyrene (Method 8270) ug/kg	Q	PQL	Benzo(b)fluoranthene (Method 8270) ug/kg	Q	PQL	Chrysene (Method 8270) ug/kg	Q	PQL	Fluoranthene (Method 8270) ug/kg	Q	PQL
DZ-5	2.7	U	2.7	21	U	21	21	U	21	27	U	27	28	U	28	37	U	37
Duplicate of J1V2K7	2.7	U	2.7	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36
DZ-1	2.7	U	2.7	20	U	20	20	U	20	27	U	27	28	U	28	37	U	37
DZ-2	2.7	U	2.7	20	U	20	20	U	20	27	U	27	27	U	27	37	U	37
DZ-3	2.9	J	2.7	20	U	20	20	U	20	27	U	27	27	U	27	36	U	36
DZ-4	2.7	U	2.7	21	U	21	21	U	21	27	U	27	28	U	28	37	U	37
DZ-6	2.5	U	2.5	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36
DZ-7	2.7	U	2.7	21	U	21	21	U	21	27	U	27	28	U	28	37	U	37
DZ-8	2.7	U	2.7	32	J	20	20	U	20	40	JK	27	43	J	28	58	J	37
DZ-9	2.6	U	2.6	21	U	21	21	U	21	28	U	28	28	U	28	38	U	38
DZ-10	2.6	U	2.6	21	U	21	21	U	21	27	U	27	28	U	28	38	U	38
DZ-11	42		2.7	40	J	21	34	J	21	27	U	27	48	J	28	72	J	38
DZ-12	14		2.8	21	U	21	21	U	21	27	U	27	28	U	28	37	U	37

3-Part Test Evaluations

	Fluoranthene (Method 8310)	Indeno(1,2,3-cd)pyrene (Method 8310)	Phenanthrene (Method 8310)	Pyrene (Method 8310)	Aroclor-1254	Benzo(a)anthracene (Method 8270)	Benzo(a)pyrene (Method 8270)	Benzo(b)fluoranthene (Method 8270)	Chrysene (Method 8270)	Fluoranthene (Method 8270)
% < Detection limit	83%	92%	92%	83%	75%	83%	92%	92%	83%	83%
Maximum value	60	19	37	74	42	40	34	40	48	72
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise	18,000 ug/kg River Protection	330 ug/kg GW & River Protection	240,000 ug/kg GW Protection	48,000 ug/kg GW & River Protection	17 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection	18,000 ug/kg River Protection
3-PART TEST										
Maximum > Cleanup Limit?	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	YES	YES	YES	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

Rev. No. 0
Date 03/10/15
Sheet No. 20 of 30

1 **100-D-86:1 Subsite Maximum Calculations**
2 **Verification Data - Deep Zone**

3	Sample	Sample	Sample	Phenanthrene (Method 8270)			Pyrene (Method 8270)		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL
5	DZ-5	J1V2K7	1/7/15	17	U	17	12	U	12
6	Duplicate of J1V2K7	J1V2L5	1/7/15	17	U	17	12	U	12
7	DZ-1	J1V2K3	1/7/15	17	U	17	12	U	12
8	DZ-2	J1V2K4	1/7/15	17	U	17	12	U	12
9	DZ-3	J1V2K5	1/7/15	17	U	17	12	U	12
10	DZ-4	J1V2K6	1/7/15	18	U	18	13	U	13
11	DZ-6	J1V2K8	1/7/15	17	U	17	12	U	12
12	DZ-7	J1V2K9	1/7/15	18	U	18	13	U	13
13	DZ-8	J1V2L0	1/7/15	17	U	17	55	J	12
14	DZ-9	J1V2L1	1/7/15	18	U	18	13	U	13
15	DZ-10	J1V2L2	1/7/15	18	U	18	13	U	13
16	DZ-11	J1V2L3	1/7/15	43	J	18	77	J	13
17	DZ-12	J1V2L4	1/7/15	18	U	18	21	J	13

18 **3-Part Test Evaluations**

19		Phenanthrene (Method 8270)			Pyrene (Method 8270)		
20	% < Detection limit	92%			75%		
21	Maximum value	43			77		
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	240,000 ug/kg	GW Protection		48,000 ug/kg	GW & River Protection	
23	**3-PART TEST**						
24	Maximum > Cleanup Limit?	NO			NO		
25	> 10% above Cleanup Limit?	NO			NO		
26	Any sample > 2X Cleanup Limit?	NO			NO		
27	**3-Part Test Compliance?**	The data set meets the 3-part test criteria when compared to the most stringent RAG.			The data set meets the 3-part test criteria when compared to the most stringent RAG.		

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CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
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Date 03/10/15
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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Shallow Zone

Arsenic 95% UCL Calculation

DATA	ID
3.1	J1V2J2/ J1V2K1
2.5	J1V2H9
3.8	J1V2J0
3.7	J1V2J1
1.8	J1V2J3
2.6	J1V2J4
2.7	J1V2J5
2.7	J1V2J6
4.5	J1V2J7
2.8	J1V2J8
2.8	J1V2J9
3.4	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	3.0
Censored		Lognormal mean	3.0
Detection limit or PQL		Std. devn.	0.72
Method detection limit		Median	2.8
TOTAL	12	Min.	1.8
		Max.	4.5

Lognormal distribution? r-squared is: 0.940
Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.5

Barium 95% UCL Calculation

DATA	ID
62.3	J1V2J2/ J1V2K1
64.5	J1V2H9
66.3	J1V2J0
66.3	J1V2J1
80.4	J1V2J3
57.9	J1V2J4
64.7	J1V2J5
45.9	J1V2J6
77.8	J1V2J7
61.8	J1V2J8
72.5	J1V2J9
72.6	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	66.1
Censored		Lognormal mean	66.2
Detection limit or PQL		Std. devn.	9.2
Method detection limit		Median	65.5
TOTAL	12	Min.	45.9
		Max.	80.4

Lognormal distribution? r-squared is: 0.904
Normal distribution? r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 71.7

Cadmium 95% UCL Calculation

DATA	ID
0.13	J1V2J2/ J1V2K1
0.11	J1V2H9
0.11	J1V2J0
0.14	J1V2J1
0.10	J1V2J3
0.11	J1V2J4
0.13	J1V2J5
0.13	J1V2J6
0.16	J1V2J7
0.13	J1V2J8
0.11	J1V2J9
0.14	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.13
Censored		Lognormal mean	0.13
Detection limit or PQL		Std. devn.	0.017
Method detection limit		Median	0.13
TOTAL	12	Min.	0.10
		Max.	0.16

Lognormal distribution? r-squared is: 0.918
Normal distribution? r-squared is: 0.911
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.13

Chromium 95% UCL Calculation

DATA	ID
9.4	J1V2J2/ J1V2K1
7.9	J1V2H9
9.1	J1V2J0
7.7	J1V2J1
4.3	J1V2J3
6.5	J1V2J4
7.0	J1V2J5
6.9	J1V2J6
6.1	J1V2J7
6.6	J1V2J8
7.6	J1V2J9
10.3	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	7.5
Censored		Lognormal mean	7.5
Detection limit or PQL		Std. devn.	1.6
Method detection limit		Median	7.3
TOTAL	12	Min.	4.3
		Max.	10.3

Lognormal distribution? r-squared is: 0.932
Normal distribution? r-squared is: 0.963
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.5

Cobalt 95% UCL Calculation

DATA	ID
7.0	J1V2J2/ J1V2K1
7.5	J1V2H9
9.1	J1V2J0
8.3	J1V2J1
11.1	J1V2J3
7.6	J1V2J4
8.3	J1V2J5
8.3	J1V2J6
7.6	J1V2J7
8.1	J1V2J8
9.4	J1V2J9
9.2	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	8.5
Censored		Lognormal mean	8.5
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	8.3
TOTAL	12	Min.	7.0
		Max.	11.1

Lognormal distribution? r-squared is: 0.931
Normal distribution? r-squared is: 0.897
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 9.1

Copper 95% UCL Calculation

DATA	ID
13.5	J1V2J2/ J1V2K1
13.6	J1V2H9
18.7	J1V2J0
14.5	J1V2J1
16.0	J1V2J3
12.7	J1V2J4
15.1	J1V2J5
13.8	J1V2J6
14.9	J1V2J7
14.1	J1V2J8
15.7	J1V2J9
17.4	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	15.0
Censored		Lognormal mean	15.0
Detection limit or PQL		Std. devn.	1.7
Method detection limit		Median	14.7
TOTAL	12	Min.	12.7
		Max.	18.7

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.933
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.9

Hexavalent chromium 95% UCL Calculation

DATA	ID
0.190	J1V2J2/ J1V2K1
0.317	J1V2H9
0.323	J1V2J0
0.209	J1V2J1
0.0775	J1V2J3
0.249	J1V2J4
0.202	J1V2J5
0.180	J1V2J6
0.286	J1V2J7
0.245	J1V2J8
0.246	J1V2J9
0.272	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.233
Censored		Lognormal mean	0.237
Detection limit or PQL		Std. devn.	0.0677
Method detection limit		Median	0.246
TOTAL	12	Min.	0.0775
		Max.	0.323

Lognormal distribution? r-squared is: 0.779
Normal distribution? r-squared is: 0.929
Recommendations:
Use normal distribution.

UCL (based on t-statistic) Is 0.268

Lead 95% UCL Calculation

DATA	ID
3.9	J1V2J2/ J1V2K1
4.4	J1V2H9
5.4	J1V2J0
4.7	J1V2J1
3.2	J1V2J3
3.9	J1V2J4
5.0	J1V2J5
4.1	J1V2J6
6.8	J1V2J7
5.4	J1V2J8
4.1	J1V2J9
5.2	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	4.7
Censored		Lognormal mean	4.7
Detection limit or PQL		Std. devn.	1.0
Method detection limit		Median	4.6
TOTAL	12	Min.	3.2
		Max.	6.8

Lognormal distribution? r-squared is: 0.963
Normal distribution? r-squared is: 0.937
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.2

Manganese 95% UCL Calculation

DATA	ID
287	J1V2J2/ J1V2K1
287	J1V2H9
355	J1V2J0
313	J1V2J1
384	J1V2J3
292	J1V2J4
317	J1V2J5
310	J1V2J6
282	J1V2J7
295	J1V2J8
355	J1V2J9
382	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	322
Censored		Lognormal mean	322
Detection limit or PQL		Std. devn.	37.6
Method detection limit		Median	312
TOTAL	12	Min.	282
		Max.	384

Lognormal distribution? r-squared is: 0.892
Normal distribution? r-squared is: 0.879
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 339

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
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Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Shallow Zone

Mercury 95% UCL Calculation

DATA	ID
0.0064	J1V2J2/ J1V2K1
0.0087	J1V2H9
0.0027	J1V2J0
0.023	J1V2J1
0.0029	J1V2J3
0.011	J1V2J4
0.10	J1V2J5
0.44	J1V2J6
0.29	J1V2J7
0.28	J1V2J8
0.0027	J1V2J9
0.0080	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.098
Censored		Lognormal mean	0.14
Detection limit or PQL		Std. devn.	0.15
Method detection limit		Median	0.010
TOTAL	12	Min.	0.0027
		Max.	0.44

Lognormal distribution? r-squared is: 0.887
Normal distribution? r-squared is: 0.690
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.17

Nickel 95% UCL Calculation

DATA	ID
10.7	J1V2J2/ J1V2K1
11.1	J1V2H9
11.7	J1V2J0
10.2	J1V2J1
7.2	J1V2J3
8.8	J1V2J4
9.3	J1V2J5
8.9	J1V2J6
8.5	J1V2J7
8.3	J1V2J8
10.9	J1V2J9
11.5	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	9.8
Censored		Lognormal mean	9.8
Detection limit or PQL		Std. devn.	1.4
Method detection limit		Median	9.8
TOTAL	12	Min.	7.2
		Max.	11.7

Lognormal distribution? r-squared is: 0.947
Normal distribution? r-squared is: 0.955
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.6

Vanadium 95% UCL Calculation

DATA	ID
49.1	J1V2J2/ J1V2K1
54.6	J1V2H9
57.1	J1V2J0
61.6	J1V2J1
91.3	J1V2J3
55.1	J1V2J4
63.5	J1V2J5
60.3	J1V2J6
55.5	J1V2J7
66.5	J1V2J8
64.2	J1V2J9
61.5	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	61.7
Censored		Lognormal mean	61.7
Detection limit or PQL		Std. devn.	10.5
Method detection limit		Median	60.9
TOTAL	12	Min.	49.1
		Max.	91.3

Lognormal distribution? r-squared is: 0.830
Normal distribution? r-squared is: 0.752
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 66.7

Zinc 95% UCL Calculation

DATA	ID
36.9	J1V2J2/ J1V2K1
43.0	J1V2H9
49.5	J1V2J0
47.0	J1V2J1
45.3	J1V2J3
39.1	J1V2J4
44.4	J1V2J5
42.3	J1V2J6
50.1	J1V2J7
44.6	J1V2J8
45.8	J1V2J9
48.5	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	44.7
Censored		Lognormal mean	44.7
Detection limit or PQL		Std. devn.	4.0
Method detection limit		Median	45.0
TOTAL	12	Min.	36.9
		Max.	50.1

Lognormal distribution? r-squared is: 0.947
Normal distribution? r-squared is: 0.963
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 47.0

TPH - Diesel Range EXT 95% UCL Calculation

DATA	ID
6000	J1V2J2/ J1V2K1
5600	J1V2H9
2600	J1V2J0
8300	J1V2J1
475	J1V2J3
27000	J1V2J4
12000	J1V2J5
4200	J1V2J6
21000	J1V2J7
24000	J1V2J8
500	J1V2J9
550	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	9352
Censored		Lognormal mean	13612
Detection limit or PQL		Std. devn.	9544
Method detection limit		Median	5800
TOTAL	12	Min.	475
		Max.	27000

Lognormal distribution? r-squared is: 0.912
Normal distribution? r-squared is: 0.858
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 77833

TPH - Diesel Range 95% UCL Calculation

DATA	ID
2550	J1V2J2/ J1V2K1
2500	J1V2H9
960	J1V2J0
3900	J1V2J1
325	J1V2J3
9900	J1V2J4
4500	J1V2J5
1800	J1V2J6
8700	J1V2J7
11000	J1V2J8
350	J1V2J9
360	J1V2K0

Number of samples		Uncensored values	
Uncensored	12	Mean	3904
Censored		Lognormal mean	4907
Detection limit or PQL		Std. devn.	3868
Method detection limit		Median	2525
TOTAL	12	Min.	325
		Max.	11000

Lognormal distribution? r-squared is: 0.929
Normal distribution? r-squared is: 0.854
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 19335

Washington Closure Hanford

CALCULATION SHEET

Originator	J. D. Skoglie	Date	03/10/15
Project	100-D Area Closure Operations	Job No.	14655
Subject	100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations		

Calc. No.	0100D-CA-V0586	Rev. No.	0
Checked	I. B. Berezovskiy	Date	03/10/15
		Sheet No.	23 of 30

Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Overburden

Arsenic 95% UCL Calculation

DATA	ID
2.3	J1V2L6/ J1V2M8
2.7	J1V2L7
2.3	J1V2L8
4.2	J1V2L9
2.0	J1V2M0
2.1	J1V2M1
2.3	J1V2M2
2.4	J1V2M3
2.4	J1V2M4
2.1	J1V2M5
2.7	J1V2M6
1.9	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	2.4
Censored		Lognormal mean	2.4
Detection limit or PQL		Std. devn.	0.61
Method detection limit		Median	2.3
TOTAL	12	Min.	1.9
		Max.	4.2

Lognormal distribution? r-squared is: 0.793
Normal distribution? r-squared is: 0.686
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 2.7

Barium 95% UCL Calculation

DATA	ID
56.5	J1V2L6/ J1V2M8
64.4	J1V2L7
52.8	J1V2L8
71.2	J1V2L9
54.3	J1V2M0
56.8	J1V2M1
57.3	J1V2M2
76.6	J1V2M3
60.0	J1V2M4
59.7	J1V2M5
63.5	J1V2M6
69.3	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	61.9
Censored		Lognormal mean	61.9
Detection limit or PQL		Std. devn.	7.3
Method detection limit		Median	59.9
TOTAL	12	Min.	52.8
		Max.	76.6

Lognormal distribution? r-squared is: 0.954
Normal distribution? r-squared is: 0.936
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 65.8

Cadmium 95% UCL Calculation

DATA	ID
0.13	J1V2L6/ J1V2M8
0.16	J1V2L7
0.14	J1V2L8
0.16	J1V2L9
0.15	J1V2M0
0.11	J1V2M1
0.13	J1V2M2
0.15	J1V2M3
0.14	J1V2M4
0.14	J1V2M5
0.14	J1V2M6
0.16	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.14
Censored		Lognormal mean	0.14
Detection limit or PQL		Std. devn.	0.015
Method detection limit		Median	0.14
TOTAL	12	Min.	0.11
		Max.	0.16

Lognormal distribution? r-squared is: 0.885
Normal distribution? r-squared is: 0.908
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.15

Chromium 95% UCL Calculation

DATA	ID
6.6	J1V2L6/ J1V2M8
8.0	J1V2L7
7.5	J1V2L8
8.9	J1V2L9
7.0	J1V2M0
7.8	J1V2M1
6.4	J1V2M2
7.4	J1V2M3
7.5	J1V2M4
5.8	J1V2M5
5.5	J1V2M6
7.4	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	7.2
Censored		Lognormal mean	7.2
Detection limit or PQL		Std. devn.	0.95
Method detection limit		Median	7.4
TOTAL	12	Min.	5.5
		Max.	8.9

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.963
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.7

Cobalt 95% UCL Calculation

DATA	ID
8.7	J1V2L6/ J1V2M8
8.5	J1V2L7
7.7	J1V2L8
8.1	J1V2L9
8.4	J1V2M0
6.9	J1V2M1
7.6	J1V2M2
8.0	J1V2M3
8.3	J1V2M4
7.7	J1V2M5
8.6	J1V2M6
8.8	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	8.1
Censored		Lognormal mean	8.1
Detection limit or PQL		Std. devn.	0.56
Method detection limit		Median	8.2
TOTAL	12	Min.	6.9
		Max.	8.8

Lognormal distribution? r-squared is: 0.922
Normal distribution? r-squared is: 0.938
Recommendations:
Use lognormal distribution,

UCL (Land's method) is 8.4

Copper 95% UCL Calculation

DATA	ID
14.6	J1V2L6/ J1V2M8
13.7	J1V2L7
14.0	J1V2L8
14.4	J1V2L9
13.7	J1V2M0
12.5	J1V2M1
12.1	J1V2M2
14.3	J1V2M3
13.9	J1V2M4
14.1	J1V2M5
12.9	J1V2M6
14.3	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	13.7
Censored		Lognormal mean	13.7
Detection limit or PQL		Std. devn.	0.79
Method detection limit		Median	14.0
TOTAL	12	Min.	12.1
		Max.	14.6

Lognormal distribution? r-squared is: 0.860
Normal distribution? r-squared is: 0.872
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 14.1

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.0775	J1V2L6/ J1V2M8
0.213	J1V2L7
0.0775	J1V2L8
0.0775	J1V2L9
0.168	J1V2M0
0.0775	J1V2M1
0.0775	J1V2M2
0.214	J1V2M3
0.0775	J1V2M4
0.212	J1V2M5
0.214	J1V2M6
0.169	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.138
Censored		Lognormal mean	0.140
Detection limit or PQL		Std. devn.	0.0650
Method detection limit		Median	0.123
TOTAL	12	Min.	0.0775
		Max.	0.214

Lognormal distribution? r-squared is: 0.747
Normal distribution? r-squared is: 0.765
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.169

Lead 95% UCL Calculation

DATA	ID
5.0	J1V2L6/ J1V2M8
5.8	J1V2L7
4.7	J1V2L8
9.4	J1V2L9
5.0	J1V2M0
2.8	J1V2M1
4.9	J1V2M2
6.0	J1V2M3
5.7	J1V2M4
4.5	J1V2M5
3.9	J1V2M6
5.6	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	5.3
Censored		Lognormal mean	5.3
Detection limit or PQL		Std. devn.	1.6
Method detection limit		Median	5.0
TOTAL	12	Min.	2.8
		Max.	9.4

Lognormal distribution? r-squared is: 0.892
Normal distribution? r-squared is: 0.824
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 6.0

Manganese 95% UCL Calculation

DATA	ID
310	J1V2L6/ J1V2M8
325	J1V2L7
270	J1V2L8
323	J1V2L9
309	J1V2M0
278	J1V2M1
287	J1V2M2
311	J1V2M3
307	J1V2M4
300	J1V2M5
331	J1V2M6
372	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	310
Censored		Lognormal mean	310
Detection limit or PQL		Std. devn.	27
Method detection limit		Median	310
TOTAL	12	Min.	270
		Max.	372

Lognormal distribution? r-squared is: 0.944
Normal distribution? r-squared is: 0.927
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 325

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CALCULATION SHEET

Originator	J. D. Skoglie	Date	03/10/15
Project	100-D Area Closure Operations	Job No.	14655
Subject	100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations		

Calc. No.	0100D-CA-V0586	Rev. No.	0
Checked	I. B. Berezovskiy	Date	03/10/15
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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Overburden

Mercury 95% UCL Calculation

DATA	ID
0.30	J1V2L6/ J1V2M8
0.084	J1V2L7
0.35	J1V2L8
0.011	J1V2L9
0.11	J1V2M0
0.050	J1V2M1
0.12	J1V2M2
0.22	J1V2M3
0.13	J1V2M4
0.070	J1V2M5
0.084	J1V2M6
0.092	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.14
Censored		Lognormal mean	0.15
Detection limit or PQL		Std. devn.	0.10
Method detection limit		Median	0.10
TOTAL	12	Min.	0.011
		Max.	0.35

Lognormal distribution? r-squared is: 0.891
Normal distribution? r-squared is: 0.859
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.18

Nickel 95% UCL Calculation

DATA	ID
10.9	J1V2L6/ J1V2M8
9.7	J1V2L7
10.9	J1V2L8
11.8	J1V2L9
9.5	J1V2M0
10.9	J1V2M1
8.1	J1V2M2
10.0	J1V2M3
9.2	J1V2M4
7.7	J1V2M5
9.6	J1V2M6
9.7	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	9.8
Censored		Lognormal mean	9.8
Detection limit or PQL		Std. devn.	1.2
Method detection limit		Median	9.7
TOTAL	12	Min.	7.7
		Max.	11.8

Lognormal distribution? r-squared is: 0.939
Normal distribution? r-squared is: 0.952
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.5

Vanadium 95% UCL Calculation

DATA	ID
62.7	J1V2L6/ J1V2M8
65.3	J1V2L7
56.2	J1V2L8
56.6	J1V2L9
62.6	J1V2M0
50.0	J1V2M1
56.6	J1V2M2
62.6	J1V2M3
64.5	J1V2M4
64.5	J1V2M5
53.8	J1V2M6
65.5	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	60.1
Censored		Lognormal mean	60.1
Detection limit or PQL		Std. devn.	5.2
Method detection limit		Median	62.6
TOTAL	12	Min.	50.0
		Max.	65.5

Lognormal distribution? r-squared is: 0.878
Normal distribution? r-squared is: 0.887
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 62.5

Zinc 95% UCL Calculation

DATA	ID
42.0	J1V2L6/ J1V2M8
46.7	J1V2L7
40.6	J1V2L8
43.5	J1V2L9
43.8	J1V2M0
35.9	J1V2M1
40.6	J1V2M2
46.2	J1V2M3
45.5	J1V2M4
43.8	J1V2M5
42.0	J1V2M6
47.3	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	43.2
Censored		Lognormal mean	43.2
Detection limit or PQL		Std. devn.	3.2
Method detection limit		Median	43.7
TOTAL	12	Min.	35.9
		Max.	47.3

Lognormal distribution? r-squared is: 0.910
Normal distribution? r-squared is: 0.930
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 45.0

TPH - Diesel Range EXT 95% UCL Calculation

DATA	ID
9700	J1V2L6/ J1V2M8
8400	J1V2L7
8500	J1V2L8
4700	J1V2L9
8100	J1V2M0
1600	J1V2M1
6600	J1V2M2
22000	J1V2M3
12000	J1V2M4
8100	J1V2M5
8000	J1V2M6
11000	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	9058
Censored		Lognormal mean	9482
Detection limit or PQL		Std. devn.	4905
Method detection limit		Median	8250
TOTAL	12	Min.	1600
		Max.	22000

Lognormal distribution? r-squared is: 0.820
Normal distribution? r-squared is: 0.811
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 11388

TPH - Diesel Range 95% UCL Calculation

DATA	ID
4850	J1V2L6/ J1V2M8
4300	J1V2L7
4100	J1V2L8
2200	J1V2L9
5300	J1V2M0
900	J1V2M1
3400	J1V2M2
14000	J1V2M3
5000	J1V2M4
4000	J1V2M5
3700	J1V2M6
5000	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	4729
Censored		Lognormal mean	4863
Detection limit or PQL		Std. devn.	3183
Method detection limit		Median	4200
TOTAL	12	Min.	900
		Max.	14000

Lognormal distribution? r-squared is: 0.827
Normal distribution? r-squared is: 0.669
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 6241

Benzo(a)anthracene (Method 8310) 95% UCL Calculation

DATA	ID
7.7	J1V2L6/ J1V2M8
26	J1V2L7
9.7	J1V2L8
1.7	J1V2L9
1.7	J1V2M0
1.7	J1V2M1
14	J1V2M2
300	J1V2M3
14	J1V2M4
8.3	J1V2M5
6.0	J1V2M6
7.5	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	33
Censored		Lognormal mean	24
Detection limit or PQL		Std. devn.	84
Method detection limit		Median	8.0
TOTAL	12	Min.	1.7
		Max.	300

Lognormal distribution? r-squared is: 0.853
Normal distribution? r-squared is: 0.364
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 73

Benzo(a)pyrene (Method 8310) 95% UCL Calculation

DATA	ID
16	J1V2L6/ J1V2M8
16	J1V2L7
12	J1V2L8
3.3	J1V2L9
3.4	J1V2M0
3.4	J1V2M1
17	J1V2M2
310	J1V2M3
30	J1V2M4
20	J1V2M5
12	J1V2M6
8.0	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	38
Censored		Lognormal mean	29
Detection limit or PQL		Std. devn.	86
Method detection limit		Median	14
TOTAL	12	Min.	3.3
		Max.	310

Lognormal distribution? r-squared is: 0.837
Normal distribution? r-squared is: 0.376
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 78

Benzo(b)fluoranthene (Method 8310) 95% UCL Calculation

DATA	ID
11	J1V2L6/ J1V2M8
16	J1V2L7
8.5	J1V2L8
2.2	J1V2L9
4.9	J1V2M0
2.2	J1V2M1
11	J1V2M2
160	J1V2M3
22	J1V2M4
18	J1V2M5
8.6	J1V2M6
6.4	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	23
Censored		Lognormal mean	20
Detection limit or PQL		Std. devn.	44
Method detection limit		Median	9.6
TOTAL	12	Min.	2.2
		Max.	160

Lognormal distribution? r-squared is: 0.894
Normal distribution? r-squared is: 0.424
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 43

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CALCULATION SHEET

Originator	J. D. Skoglie	Date	03/10/15
Project	100-D Area Closure Operations	Job No.	14655
Subject	100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations		

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Overburden

Benzo(k)fluoranthene (Method 8310) 95% UCL Calculation

DATA	ID
5.3	J1V2L6/ J1V2M8
6.0	J1V2L7
2.0	J1V2L8
2.0	J1V2L9
2.1	J1V2M0
2.1	J1V2M1
5.3	J1V2M2
81	J1V2M3
11	J1V2M4
8.0	J1V2M5
2.1	J1V2M6
2.0	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	11
Censored		Lognormal mean	8.4
Detection limit or PQL		Std. devn.	22
Method detection limit		Median	3.7
TOTAL	12	Min.	2.0
		Max.	81

Lognormal distribution? r-squared is: 0.756
Normal distribution? r-squared is: 0.401
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 21

Chrysene (Method 8310) 95% UCL Calculation

DATA	ID
16	J1V2L6/ J1V2M8
18	J1V2L7
13	J1V2L8
2.5	J1V2L9
6.1	J1V2M0
2.6	J1V2M1
16	J1V2M2
320	J1V2M3
30	J1V2M4
21	J1V2M5
17	J1V2M6
10	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	39
Censored		Lognormal mean	32
Detection limit or PQL		Std. devn.	89
Method detection limit		Median	16
TOTAL	12	Min.	2.5
		Max.	320

Lognormal distribution? r-squared is: 0.852
Normal distribution? r-squared is: 0.376
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 81

Fluoranthene (Method 8310) 95% UCL Calculation

DATA	ID
28	J1V2L6/ J1V2M8
44	J1V2L7
24	J1V2L8
6.5	J1V2L9
7.0	J1V2M0
7.0	J1V2M1
35	J1V2M2
520	J1V2M3
65	J1V2M4
25	J1V2M5
27	J1V2M6
18	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	67
Censored		Lognormal mean	55
Detection limit or PQL		Std. devn.	144
Method detection limit		Median	26
TOTAL	12	Min.	6.5
		Max.	520

Lognormal distribution? r-squared is: 0.856
Normal distribution? r-squared is: 0.398
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 135

Phenanthrene (Method 8310) 95% UCL Calculation

DATA	ID
19	J1V2L6/ J1V2M8
18	J1V2L7
6.0	J1V2L8
6.0	J1V2L9
6.0	J1V2M0
6.5	J1V2M1
21	J1V2M2
240	J1V2M3
44	J1V2M4
6.5	J1V2M5
16	J1V2M6
6.0	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	33
Censored		Lognormal mean	27
Detection limit or PQL		Std. devn.	66
Method detection limit		Median	11
TOTAL	12	Min.	6.0
		Max.	240

Lognormal distribution? r-squared is: 0.776
Normal distribution? r-squared is: 0.423
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 64

Pyrene (Method 8310) 95% UCL Calculation

DATA	ID
37	J1V2L6/ J1V2M8
42	J1V2L7
30	J1V2L8
6.0	J1V2L9
6.0	J1V2M0
6.5	J1V2M1
42	J1V2M2
690	J1V2M3
80	J1V2M4
34	J1V2M5
36	J1V2M6
21	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	86
Censored		Lognormal mean	71
Detection limit or PQL		Std. devn.	191
Method detection limit		Median	35
TOTAL	12	Min.	6.0
		Max.	690

Lognormal distribution? r-squared is: 0.852
Normal distribution? r-squared is: 0.388
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 177

Aroclor-1254 95% UCL Calculation

DATA	ID
8.7	J1V2L6/ J1V2M8
29	J1V2L7
29	J1V2L8
1.3	J1V2L9
7.9	J1V2M0
1.4	J1V2M1
27	J1V2M2
64	J1V2M3
1.4	J1V2M4
1.4	J1V2M5
19	J1V2M6
1.3	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	16
Censored		Lognormal mean	21
Detection limit or PQL		Std. devn.	19
Method detection limit		Median	8.3
TOTAL	12	Min.	1.3
		Max.	64

Lognormal distribution? r-squared is: 0.855
Normal distribution? r-squared is: 0.778
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 25

Pyrene (Method 8270) 95% UCL Calculation

DATA	ID
30	J1V2L6/ J1V2M8
36	J1V2L7
21	J1V2L8
6.0	J1V2L9
22	J1V2M0
6.5	J1V2M1
24	J1V2M2
1300	J1V2M3
62	J1V2M4
39	J1V2M5
25	J1V2M6
26	J1V2M7

Number of samples		Uncensored values	
Uncensored	12	Mean	133
Censored		Lognormal mean	78
Detection limit or PQL		Std. devn.	368
Method detection limit		Median	26
TOTAL	12	Min.	6.0
		Max.	1300

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

UCL (based on Z-statistic) is 308

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Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Deep Zone

DATA	ID
1.6	J1V2K7/ J1V2L5
1.5	J1V2K3
1.5	J1V2K4
1.4	J1V2K5
1.6	J1V2K6
2.1	J1V2K8
1.8	J1V2K9
1.9	J1V2L0
1.6	J1V2L1
1.4	J1V2L2
2.8	J1V2L3
2.4	J1V2L4

Arsenic 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	1.8
Censored		Lognormal mean	1.8
Detection limit or PQL		Std. devn.	0.44
Method detection limit		Median	1.6
TOTAL	12	Min.	1.4
		Max.	2.8

Lognormal distribution? r-squared is: 0.887
Normal distribution? r-squared is: 0.838
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 2.0

DATA	ID
65.0	J1V2K7/ J1V2L5
64.4	J1V2K3
53.3	J1V2K4
72.1	J1V2K5
66.0	J1V2K6
213	J1V2K8
58.5	J1V2K9
59.2	J1V2L0
58.0	J1V2L1
63.9	J1V2L2
58.5	J1V2L3
61.2	J1V2L4

Barium 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	74.4
Censored		Lognormal mean	73.1
Detection limit or PQL		Std. devn.	43.9
Method detection limit		Median	62.6
TOTAL	12	Min.	53.3
		Max.	213

Lognormal distribution? r-squared is: 0.496
Normal distribution? r-squared is: 0.396
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 95.3

DATA	ID
0.11	J1V2K7/ J1V2L5
0.11	J1V2K3
0.11	J1V2K4
0.13	J1V2K5
0.11	J1V2K6
0.12	J1V2K8
0.12	J1V2K9
0.11	J1V2L0
0.11	J1V2L1
0.10	J1V2L2
0.12	J1V2L3
0.10	J1V2L4

Cadmium 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	0.11
Censored		Lognormal mean	0.11
Detection limit or PQL		Std. devn.	0.0089
Method detection limit		Median	0.11
TOTAL	12	Min.	0.10
		Max.	0.13

Lognormal distribution? r-squared is: 0.918
Normal distribution? r-squared is: 0.91
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.12

DATA	ID
4.0	J1V2K7/ J1V2L5
3.4	J1V2K3
3.6	J1V2K4
3.8	J1V2K5
3.9	J1V2K6
3.7	J1V2K8
3.9	J1V2K9
4.2	J1V2L0
3.9	J1V2L1
3.7	J1V2L2
6.7	J1V2L3
6.2	J1V2L4

Chromium 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	4.2
Censored		Lognormal mean	4.2
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	3.9
TOTAL	12	Min.	3.4
		Max.	6.7

Lognormal distribution? r-squared is: 0.701
Normal distribution? r-squared is: 0.650
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 4.7

DATA	ID
9.8	J1V2K7/ J1V2L5
9.6	J1V2K3
9.7	J1V2K4
10.1	J1V2K5
9.9	J1V2K6
10.3	J1V2K8
9.2	J1V2K9
8.8	J1V2L0
9.4	J1V2L1
9.9	J1V2L2
7.9	J1V2L3
7.2	J1V2L4

Cobalt 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	9.3
Censored		Lognormal mean	9.3
Detection limit or PQL		Std. devn.	0.93
Method detection limit		Median	9.7
TOTAL	12	Min.	7.2
		Max.	10.3

Lognormal distribution? r-squared is: 0.814
Normal distribution? r-squared is: 0.845
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 9.8

DATA	ID
13.6	J1V2K7/ J1V2L5
14.0	J1V2K3
14.8	J1V2K4
15.0	J1V2K5
14.2	J1V2K6
14.4	J1V2K8
13.1	J1V2K9
14.0	J1V2L0
12.7	J1V2L1
14.0	J1V2L2
13.3	J1V2L3
12.2	J1V2L4

Copper 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	13.8
Censored		Lognormal mean	13.8
Detection limit or PQL		Std. devn.	0.83
Method detection limit		Median	14.0
TOTAL	12	Min.	12.2
		Max.	15.0

Lognormal distribution? r-squared is: 0.965
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.2

DATA	ID
2.5	J1V2K7/ J1V2L5
2.4	J1V2K3
3.0	J1V2K4
2.7	J1V2K5
2.6	J1V2K6
3.0	J1V2K8
2.6	J1V2K9
3.2	J1V2L0
2.6	J1V2L1
2.5	J1V2L2
6.2	J1V2L3
4.1	J1V2L4

Lead 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	3.1
Censored		Lognormal mean	3.1
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	2.7
TOTAL	12	Min.	2.4
		Max.	6.2

Lognormal distribution? r-squared is: 0.728
Normal distribution? r-squared is: 0.629
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 3.6

DATA	ID
298	J1V2K7/ J1V2L5
295	J1V2K3
302	J1V2K4
315	J1V2K5
306	J1V2K6
306	J1V2K8
289	J1V2K9
305	J1V2L0
299	J1V2L1
285	J1V2L2
289	J1V2L3
283	J1V2L4

Manganese 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	298
Censored		Lognormal mean	298
Detection limit or PQL		Std. devn.	9.8
Method detection limit		Median	298
TOTAL	12	Min.	283
		Max.	315

Lognormal distribution? r-squared is: 0.970
Normal distribution? r-squared is: 0.970
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 303

DATA	ID
7.2	J1V2K7/ J1V2L5
6.4	J1V2K3
6.8	J1V2K4
8.0	J1V2K5
7.0	J1V2K6
8.1	J1V2K8
6.8	J1V2K9
6.8	J1V2L0
8.5	J1V2L1
8.3	J1V2L2
8.9	J1V2L3
9.0	J1V2L4

Nickel 95% UCL Calculation

Number of samples		Uncensored values	
Uncensored	12	Mean	7.6
Censored		Lognormal mean	7.7
Detection limit or PQL		Std. devn.	0.92
Method detection limit		Median	7.6
TOTAL	12	Min.	6.4
		Max.	9.0

Lognormal distribution? r-squared is: 0.922
Normal distribution? r-squared is: 0.920
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.2

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

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Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
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Ecology Software (MTCAStat) Results, 100-D-86:1 Subsite Deep Zone

	DATA	ID	Vanadium 95% UCL Calculation				DATA	ID	Zinc 95% UCL Calculation			
1	DATA	ID	Vanadium 95% UCL Calculation				DATA	ID	Zinc 95% UCL Calculation			
2	87.2	J1V2K7/ J1V2L5					44.1	J1V2K7/ J1V2L5				
3	81.1	J1V2K3					45.1	J1V2K3				
4	80.7	J1V2K4	Number of samples		Uncensored values		44.1	J1V2K4	Number of samples		Uncensored values	
5	85.9	J1V2K5	Uncensored	12	Mean	80.0	47.5	J1V2K5	Uncensored	12	Mean	43.9
6	87.6	J1V2K6	Censored		Lognormal mean	80.2	46.0	J1V2K6	Censored		Lognormal mean	43.9
7	88.6	J1V2K8	Detection limit or PQL		Std. devn.	11.8	46.4	J1V2K8	Detection limit or PQL		Std. devn.	2.6
8	86.9	J1V2K9	Method detection limit		Median	86.4	44.6	J1V2K9	Method detection limit		Median	44.1
9	72.2	J1V2L0	TOTAL	12	Min.	52.8	42.4	J1V2L0	TOTAL	12	Min.	37.4
10	88.2	J1V2L1			Max.	88.6	43.6	J1V2L1			Max.	47.5
11	87.0	J1V2L2					41.9	J1V2L2				
12	61.6	J1V2L3					43.2	J1V2L3				
13	52.8	J1V2L4					37.4	J1V2L4				
14												
15												
16												
17			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
18			r-squared is: 0.713		r-squared is: 0.744				r-squared is: 0.871		r-squared is: 0.896	
19			Recommendations:						Recommendations:			
20			Reject BOTH lognormal and normal distributions						Reject BOTH lognormal and normal distributions			
21												
22			UCL (based on Z-statistic) is		85.6				UCL (based on Z-statistic) is		45.1	

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Area Closure Operations
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations

Date 03/10/15
Job No. 14655

Calc. No. 0100D-CA-V0586
Checked I. B. Berezovskiy

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Duplicate Analysis - 100-D-86:1 Subsite Shallow Zone

Sampling Area	Sample Number	Sample Date	Potassium-40			Uranium-234			Uranium-238			Aluminum			Arsenic			Barium			Boron			Cadmium			Calcium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	13.2		0.209	0.131		0.0534	0.204		0.0590	5970	X	1.5	2.8		0.66	61.6	X	0.076	1.0	B	0.98	0.14	B	0.041	7380	X	14.0
Duplicate of J1V2J2	J1V2K1	1/7/15	12.7		0.200	0.119		0.0537	0.147		0.0361	6210	X	1.5	3.3		0.63	62.9	X	0.072	0.95	B	0.93	0.12	B	0.039	7750	X	13.4

Analysis:

TDL		0.5	1	1	5	10	2	2	0.2	100
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	3.9%			3.9%		2.1%			4.9%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-86:1 Subsite Shallow Zone

Sampling Area	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Hexavalent Chromium			Iron			Lead			Magnesium			Manganese			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	8.9	X	0.058	6.8	X	0.10	13.1	X	0.22	0.200		0.155	18500	X	3.8	3.7		0.27	4210	X	3.7	281	X	0.10	9.6	X	0.12
Duplicate of J1V2J2	J1V2K1	1/7/15	9.9	X	0.055	7.2	X	0.095	13.9	X	0.21	0.180		0.155	19500	X	3.6	4.1		0.26	4770	X	3.5	293	X	0.095	11.8	X	0.12

Analysis:

TDL		1	2	1	0.5	5	5	75	5	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	10.6%		5.9%		5.3%		12.5%	4.2%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-86:1 Subsite Shallow Zone

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - Diesel Range EXT			TPH - Diesel Range		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	956		40.8	373		5.6	251		58.8	48.1	X	0.094	36.1	X	0.40	6700		1000	2800	J	690
Duplicate of J1V2J2	J1V2K1	1/7/15	1000		39.0	368		5.4	244		56.1	50.0	X	0.089	37.7	X	0.38	5300		1000	2300	J	680

Analysis:

TDL		400	2	50	2.5	1	5000	5000
Duplicate Analysis	Both > PQL?	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)
	RPD		1.3%		3.9%	4.3%		
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator	J. D. Skoglie	**Date**	03/10/15	**Calc. No.**	0100D-CA-V0586
Project	100-D Area Closure Operations	**Job No.**	14655	**Checked**	I. B. Berezovskiy
Subject	100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations				

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Duplicate Analysis - 100-D-86:1 Subsite Overburden

Sampling Area	Sample Number	Sample Date	Cesium-137			Potassium-40			Total beta radiostrontium			Uranium-234			Uranium-238			Aluminum			Arsenic			Barium			Cadmium			Calcium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-1	J1V2L6	1/6/15	0.332		0.0250	9.65		0.175	0.385		0.309	0.134		0.0603	0.164		0.0546	5260	X	1.5	2.1		0.62	58.3	X	0.072	0.13	B	0.039	6990	X	13.3
Duplicate of J1V2L6	J1V2M8	1/6/15	0.275		0.0248	10.9		0.208	0.347		0.267	0.109		0.0552	0.219		0.0372	5190	X	1.5	2.4		0.62	54.6	X	0.072	0.13	B	0.039	6520	X	13.3

Analysis:

TDL		0.05	0.5	1	1	1	5	10	2	0.2	100
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	18.8%	12.2%				1.3%		6.6%		7.0%
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-86:1 Subsite Overburden

Sampling Area	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Mercury			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	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-1	J1V2L6	1/6/15	5.8	X	0.055	9.0		0.19	15.0		0.41	22800	X	3.6	5.1		0.51	4450	X	3.5	304	X	0.095	0.30		0.0054	9.0	X	0.12	822		38.8
Duplicate of J1V2L6	J1V2M8	1/6/15	7.4	X	0.055	8.4		0.094	14.1		0.20	24900	X	3.6	4.8		0.25	4760	X	3.5	316	X	0.094	0.30		0.0052	12.7	X	0.12	800		38.6

Analysis:

TDL		1	2	1	5	5	75	5	0.2	4	400
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	24.2%		6.2%	8.8%		6.7%	3.9%			
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-86:1 Subsite Overburden

Sampling Area	HEIS Number	Sample Date	Silicon			Sodium			Vanadium			Zinc			TPH - Diesel Range EXT			TPH - Diesel Range			Benzo(a)anthracene (Method 8310)			Benzo(a)pyrene (Method 8310)			Benzo(b)fluoranthene (Method 8310)			Benzo(k)fluoranthene (Method 8310)		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-1	J1V2L6	1/6/15	331	N	5.4	324		55.8	63.8		0.18	42.7	X	0.38	6400		1000	3400	J	700	6.6	JX	3.2	11	JX	6.5	9.2	J	4.2	4.2	J	4.0
Duplicate of J1V2L6	J1V2M8	1/6/15	181	N	5.3	277		55.6	61.5		0.089	41.3	X	0.38	13000		1000	6300		710	8.7	JX	3.1	20		6.2	12	JX	4.1	6.3	J	3.8

Analysis:

TDL		2	50	2.5	1	5000	5000	15	15	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	*58.6%*	15.6%	3.7%	3.3%						
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-86:1 Subsite Overburden

Sampling Area	HEIS Number	Sample Date	Chrysene (Method 8310)			Fluoranthene (Method 8310)			Phenanthrene (Method 8310)			Pyrene (Method 8310)			Aroclor-1254			Pyrene (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-1	J1V2L6	1/6/15	12	J	4.9	22	J	13	15	J	12	28	J	12	8.0	J	2.7	29	J	12
Duplicate of J1V2L6	J1V2M8	1/6/15	20	J	4.7	33	JX	13	23	J	12	45		12	9.3	J	2.7	31	J	12

Analysis:

TDL		15	15	15	15	20	660
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD						
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 03/10/15 **Calc. No.** 0100D-CA-V0586 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 03/10/15
Subject 100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 30 of 30

Duplicate Analysis - 100-D-86:1 Subsite Deep Zone

Sampling Area	Sample Number	Sample Date	Potassium-40			Uranium-234			Uranium-238			Aluminum			Arsenic			Barium			Cadmium			Calcium			Chromium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	8.68		0.187	0.118		0.0652	0.228	J	0.0631	3750	X	1.4	1.5	J	0.59	63.1	X	0.068	0.11	B	0.037	6130	X	12.6	4.3	X	0.052
Duplicate of J1V2K7	J1V2L5	1/7/15	8.12		0.205	0.286	J	0.0619	0.251	J	0.0637	3830	X	1.4	1.6	J	0.61	66.8	X	0.070	0.10	B	0.038	6360	X	13.0	3.6	X	0.054

Analysis:

TDL		0.5	1	1	5	10	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)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	6.7%			2.1%		5.7%		3.7%	
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-86:1 Subsite Deep Zone

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Nickel			Potassium			Silicon		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	9.7	X	0.18	13.1		0.39	28200		6.8	2.3		0.48	4130	X	3.3	295	X	0.089	6.3	X	0.11	450		36.7	102	J	5.1
Duplicate of J1V2K7	J1V2L5	1/7/15	9.9	X	0.18	14.1		0.40	30100		7.0	2.7		0.50	4170	X	3.4	300	X	0.092	8.0	X	0.11	472		37.9	103	J	5.2

Analysis:

TDL		2	1	5	5	75	5	4	400	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		7.4%	6.5%		1.0%	1.7%			1.0%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-86:1 Subsite Deep Zone

Sampling Area	HEIS Number	Sample Date	Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
DZ-5	J1V2K7	1/7/15	336		52.8	82.0		0.17	42.8	JX	0.36
Duplicate of J1V2K7	J1V2L5	1/7/15	344		54.5	92.4		0.17	45.4	JX	0.37

Analysis:

TDL		50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	2.4%	11.9%	5.9%
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Radionuclides)

Sample Location	HEIS Number	Sample Date	Americium-241			Carbon-14			Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-4	J1V2J2	1/7/15	-0.0915	U	0.136	0.0906	U	0.265	0.0110	U	0.0305	-0.0145	U	0.0270	-0.0190	U	0.0778
Duplicate of J1V2J2	J1V2K1	1/7/15	-0.0191	U	0.0410	-0.0901	U	0.268	-0.0117	U	0.0245	-0.00942	U	0.0237	-0.0392	U	0.0588
SZ-1	J1V2H9	1/7/15	-0.00203	U	0.0278	0.0474	U	0.269	0.0425		0.0201	0.0110	U	0.0221	0.0184	U	0.0492
SZ-2	J1V2J0	1/7/15	0.00625	U	0.0263	0.0978	U	0.270	0.00959	U	0.0235	0.0025	U	0.0255	0.0171	U	0.0455
SZ-3	J1V2J1	1/7/15	0.00495	U	0.0226	0.200	U	0.267	0.0609		0.0187	-0.00515	U	0.0207	-0.0171	U	0.0412
SZ-5	J1V2J3	1/7/15	-0.00320	U	0.0201	-0.169	U	0.270	-0.00689	U	0.0149	-0.0110	U	0.0154	0.0119	U	0.0396
SZ-6	J1V2J4	1/7/15	0.00383	U	0.0282	-0.0423	U	0.269	0.147		0.0206	-0.0014	U	0.0209	0.0141	U	0.0469
SZ-7	J1V2J5	1/7/15	-0.0281	U	0.120	0.150	U	0.268	0.211		0.0238	-0.00544	U	0.0240	-0.00444	U	0.0729
SZ-8	J1V2J6	1/7/15	-0.00566	U	0.0205	-0.0451	U	0.263	0.0980		0.0166	0.00362	U	0.0207	0.0441	U	0.0442
SZ-9	J1V2J7	1/7/15	0.00893	U	0.159	0.261	U	0.270	0.292		0.0225	0.00791	U	0.0241	0.0134	U	0.0602
SZ-10	J1V2J8	1/7/15	0.00578	U	0.0251	0.262	U	0.268	0.555		0.0202	-0.00696	U	0.0209	0.00786	U	0.0451
SZ-11	J1V2J9	1/7/15	-0.0288	U	0.0391	-0.120	U	0.269	0.00489	U	0.0265	0.00715	U	0.0264	0.00133	U	0.0641
SZ-12	J1V2K0	1/7/15	-0.0190	U	0.164	0.0275	U	0.268	0.0371		0.0260	0.000164	U	0.0269	0.0292	U	0.0649
OB-1	J1V2L6	1/6/15	-0.00691	U	0.0345	0.00188	U	0.273	0.332		0.0250	0.00865	U	0.0251	0.207		0.0604
Duplicate of J1V2L6	J1V2M8	1/6/15	-0.0388	U	0.119	-0.0287	U	0.269	0.275		0.0248	0.00722	U	0.0266	-0.0199	U	0.0776
OB-2	J1V2L7	1/6/15	-0.00955	U	0.0236	-0.0411	U	0.268	0.233		0.0198	0.000471	U	0.0248	0.0854	U	0.0534
OB-3	J1V2L8	1/6/15	0.00886	U	0.0242	0.00916	U	0.266	0.360		0.0200	0.000579	U	0.0215	0.120	U	0.0571
OB-4	J1V2L9	1/6/15	0.0468	U	0.109	-0.0286	U	0.266	0.293		0.0347	0.00538	U	0.0326	-0.0309	U	0.0818
OB-5	J1V2M0	1/6/15	0.0467	U	0.0965	-0.111	U	0.273	0.400		0.0330	0.00606	U	0.0324	-0.00934	U	0.0847
OB-6	J1V2M1	1/6/15	-0.0293	U	0.134	0.0404	U	0.268	0.00448	U	0.0288	0.00220	U	0.0284	-0.101	U	0.0775
OB-7	J1V2M2	1/6/15	-0.0112	U	0.152	0.0430	U	0.272	0.282		0.0222	-0.00590	U	0.0217	-0.00101	U	0.0585
OB-8	J1V2M3	1/6/15	-0.0182	U	0.0389	0.0230	U	0.271	0.435		0.0253	0.0104	U	0.0266	0.00408	U	0.0645
OB-9	J1V2M4	1/6/15	-0.0116	U	0.0276	0.129	U	0.273	0.615		0.0216	0.00441	U	0.0249	-0.00169	U	0.0497
OB-10	J1V2M5	1/6/15	0.00123	U	0.0217	-0.0738	U	0.272	0.179		0.0193	0.00132	U	0.0215	0.0246	U	0.0420
OB-11	J1V2M6	1/6/15	-0.000319	U	0.0274	0.101	U	0.273	0.273		0.0210	-0.00373	U	0.0214	0.0141	U	0.0463
OB-12	J1V2M7	1/6/15	0.000733	U	0.0987	-0.0117	U	0.273	0.362		0.0321	0.0154	U	0.0311	0.00715	U	0.0843
DZ-5	J1V2K7	1/7/15	0.0107	U	0.0264	-0.0149	UJ	0.524	0.0141	U	0.0180	-0.000551	U	0.0221	0.00540	U	0.0469
Duplicate of J1V2K7	J1V2L5	1/7/15	-0.0173	U	0.0333	0.0109	UJ	0.519	0.0222	U	0.0278	0.00391	U	0.0239	-0.0270	U	0.0537
DZ-1	J1V2K3	1/7/15	-0.000704	U	0.0301	0.0570	UJ	0.521	1.04		0.0260	0.00101	U	0.0259	0.0428	U	0.0590
DZ-2	J1V2K4	1/7/15	-0.0375	U	0.113	0.0823	UJ	0.526	0.00438	U	0.0252	-0.00569	U	0.0236	-0.293	U	0.0690
DZ-3	J1V2K5	1/7/15	-0.000803	U	0.0214	0.156	UJ	0.521	-0.00885	U	0.0174	-0.00357	U	0.0186	-0.00726	U	0.0408
DZ-4	J1V2K6	1/7/15	-0.00979	U	0.0206	0.275	UJ	0.526	-0.00137	U	0.0191	-0.00968	U	0.0203	0.0178	U	0.0427
DZ-6	J1V2K8	1/7/15	-0.0116	U	0.151	0.190	UJ	0.528	0.00176	U	0.0232	0.00114	U	0.0236	-0.0106	U	0.0563
DZ-7	J1V2K9	1/7/15	0.00651	U	0.0359	-0.0148	UJ	0.525	0.00832	U	0.0258	-0.00838	U	0.0231	-0.0105	U	0.0564
DZ-8	J1V2L0	1/7/15	0.00410	U	0.0223	-0.0275	UJ	0.525	0.00578	U	0.0205	-0.00388	U	0.0204	0.00545	U	0.0424
DZ-9	J1V2L1	1/7/15	-0.00138	U	0.0212	-0.0249	UJ	0.526	-0.000825	U	0.0182	0.00637	U	0.0246	0.00787	U	0.0396
DZ-10	J1V2L2	1/7/15	-0.00134	U	0.0250	0.0749	UJ	0.523	0.00199	U	0.0212	0.000796	U	0.0239	-0.00406	U	0.0448
DZ-11	J1V2L3	1/7/15	-0.0449	U	0.117	0.300	UJ	0.526	0.0714		0.0240	0.0177	U	0.0281	-0.0033	U	0.0732
DZ-12	J1V2L4	1/7/15	0.0396	U	0.126	0.214	UJ	0.524	-0.00278	U	0.0183	0.00544	U	0.0194	-0.0124	U	0.0465

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

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

B = blank contamination (inorganic constituents)

C = </= 5x the blank concentration

DZ = deep zone

EXT = extended

HEIS = Hanford Environmental Information

J = estimate

K = Benzo(b&k)fluoranthene are unresolved due to matrix interference. Result is reported as benzo(b)fluoranthene.

MDA = minimum dection allowed

N = recovery is outside control limits

OB = overburden

PCB = polychlorinated biphenyls

PQL = practical quantitation limit

Q = qualifier

SVOA = semivolatile organic analysis

SZ = shallow zone

TPH = total petroleum hydrocarbons

U = undetected

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

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

Attachment	1	Sheet No.	1 of 23
Originator	J. D. Skoglie	Date	3/12/15
Checked	I. B. Berezovskiy	Date	3/12/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Europium-154			Europium-155			Plutonium-238			Plutonium-239/240			Potassium-40		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-4	J1V2J2	1/7/15	-0.0336	U	0.0894	-0.00112	U	0.0981	0.00467	U	0.0956	0.000	U	0.0396	13.2		0.209
Duplicate of J1V2J2	J1V2K1	1/7/15	-0.0184	U	0.0785	0.0148	U	0.0632	0.0135	U	0.0510	-0.00112	U	0.0564	12.7		0.200
SZ-1	J1V2H9	1/7/15	0.00291	U	0.0746	0.0335	U	0.0447	0.0197	U	0.0978	0.0131	U	0.0645	11.1		0.168
SZ-2	J1V2J0	1/7/15	0.00972	U	0.0853	0.0662		0.0378	0.00628	U	0.0990	0.0138	U	0.0678	13.2		0.169
SZ-3	J1V2J1	1/7/15	0.0143	U	0.0735	0.0478		0.0349	-0.0134	U	0.105	-0.000583	U	0.0531	10.5		0.193
SZ-5	J1V2J3	1/7/15	0.0150	U	0.0647	0.0358		0.0312	0.00467	U	0.0954	-0.000583	U	0.0531	8.88		0.159
SZ-6	J1V2J4	1/7/15	-0.00702	U	0.0692	0.0337	U	0.0446	-0.00829	U	0.0916	-0.00237	U	0.0676	11.1		0.172
SZ-7	J1V2J5	1/7/15	-0.0224	U	0.0823	-0.00749	U	0.0892	0.0107	U	0.0703	0.0130	U	0.0567	10.8		0.161
SZ-8	J1V2J6	1/7/15	0.0106	U	0.0686	0.0235	U	0.0346	-0.00115	U	0.0576	0.0132	U	0.0576	9.48		0.161
SZ-9	J1V2J7	1/7/15	-0.0243	U	0.0727	0.0689	U	0.0708	-0.00342	U	0.0711	-0.00114	U	0.0574	10.0		0.184
SZ-10	J1V2J8	1/7/15	-0.00172	U	0.0724	0.0307	U	0.0390	-0.00220	U	0.0629	-0.000550	U	0.0501	10.4		0.199
SZ-11	J1V2J9	1/7/15	-0.0171	U	0.0803	0.0364	U	0.0626	0.0126	U	0.0621	-0.00115	U	0.0578	10.8		0.197
SZ-12	J1V2K0	1/7/15	-0.0157	U	0.0819	-0.00818	U	0.0735	-0.00268	U	0.0643	-0.000537	U	0.0488	12.5		0.217
OB-1	J1V2L6	1/6/15	0.0366	U	0.0794	0.0107	U	0.0567	0.0252	U	0.137	0.0381	U	0.0877	9.65		0.175
Duplicate of J1V2L6	J1V2M8	1/6/15	-0.0368	U	0.0777	0.000267	U	0.0897	-0.00329	U	0.0683	-0.000548	U	0.0498	10.9		0.208
OB-2	J1V2L7	1/6/15	0.00603	U	0.0736	0.0401	U	0.0378	0.0204	U	0.0919	-0.00233	U	0.0665	11.1		0.222
OB-3	J1V2L8	1/6/15	0.0368	U	0.0771	0.0256	U	0.0379	0.0164	U	0.0987	0.0136	U	0.0515	11.0		0.157
OB-4	J1V2L9	1/6/15	0.0256	U	0.120	0.0605	U	0.0868	0.00301	U	0.103	0.000	U	0.0408	12.7		0.299
OB-5	J1V2M0	1/6/15	0.00465	U	0.100	0.0291	U	0.0773	-0.0108	U	0.0994	0.0137	U	0.0601	10.9		0.271
OB-6	J1V2M1	1/6/15	-0.0106	U	0.0864	-0.0107	U	0.0928	-0.00802	U	0.0887	-0.00172	U	0.0619	13.0		0.220
OB-7	J1V2M2	1/6/15	-0.00699	U	0.0720	0.0285	U	0.0693	0.0147	U	0.103	-0.00340	U	0.0706	10.5		0.164
OB-8	J1V2M3	1/6/15	-0.00642	U	0.0745	0.0410	U	0.0624	0.00168	U	0.099	-0.000560	U	0.0509	11.3		0.178
OB-9	J1V2M4	1/6/15	0.00991	U	0.0777	0.0392	U	0.0431	0.00284	U	0.0977	-0.00114	U	0.0572	11.6		0.225
OB-10	J1V2M5	1/6/15	-0.0459	U	0.0556	0.0331		0.0330	-0.00845	U	0.0934	-0.00302	U	0.0723	10.4		0.159
OB-11	J1V2M6	1/6/15	0.0255	U	0.0749	0.0122	U	0.0418	-0.00341	U	0.0710	-0.00114	U	0.0573	10.3		0.170
OB-12	J1V2M7	1/6/15	-0.0479	U	0.100	0.0110	U	0.0743	0.0139	U	0.0609	0.0139	U	0.0608	11.4		0.248
DZ-5	J1V2K7	1/7/15	-0.0212	U	0.0697	0.00543	U	0.0404	-0.00335	UJ	0.0697	-0.00112	U	0.0562	8.68		0.187
Duplicate of J1V2K7	J1V2L5	1/7/15	-0.0125	U	0.0765	0.00807	U	0.0553	0.0163	UJ	0.108	-0.00121	U	0.0607	8.12		0.205
DZ-1	J1V2K3	1/7/15	0.00363	U	0.0844	0.0607	U	0.0491	-0.0132	UJ	0.106	-0.00180	U	0.0649	13.3		0.159
DZ-2	J1V2K4	1/7/15	-0.0388	U	0.0744	-0.0295	U	0.0800	0.00554	UJ	0.0989	-0.00185	U	0.0664	9.35		0.194
DZ-3	J1V2K5	1/7/15	0.0129	U	0.0669	0.0244	U	0.0352	0.0266	UJ	0.0753	-0.00121	U	0.0608	9.09		0.222
DZ-4	J1V2K6	1/7/15	0.00228	U	0.0721	0.0123	U	0.0332	-0.00118	UJ	0.0594	-0.00118	U	0.0594	7.87		0.145
DZ-6	J1V2K8	1/7/15	0.00296	U	0.0782	0.00887	U	0.0615	-0.00900	UJ	0.0946	-0.00240	U	0.0685	8.96		0.195
DZ-7	J1V2K9	1/7/15	0.0117	U	0.0767	0.0402	U	0.0561	-0.0136	UJ	0.106	0.0142	U	0.0538	8.48		0.250
DZ-8	J1V2L0	1/7/15	0.00125	U	0.0723	0.0104	U	0.0354	-0.0103	UJ	0.0994	0.000	U	0.0412	9.79		0.173
DZ-9	J1V2L1	1/7/15	0.0168	U	0.0740	0.0285	U	0.0354	-0.0121	UJ	0.104	-0.00182	U	0.0655	8.18		0.183
DZ-10	J1V2L2	1/7/15	0.0131	U	0.0783	0.0138	U	0.0410	-0.00388	UJ	0.0716	-0.00166	U	0.0599	8.63		0.176
DZ-11	J1V2L3	1/7/15	-0.0215	U	0.0764	-0.0315	U	0.0851	0.00353	UJ	0.0995	-0.00294	U	0.0705	10.9		0.203
DZ-12	J1V2L4	1/7/15	-0.0285	U	0.0602	0.00964	U	0.0521	-0.00970	UJ	0.0934	-0.000571	U	0.0519	6.91		0.185

Attachment	1	Sheet No.	2 of 23
Originator	J. D. Skoglie	Date	3/10/15
Checked	I. B. Berezovskiy	Date	3/10/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Total beta radiostrontium			Tritium			Uranium-234			Uranium-235			Uranium-238		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-4	J1V2J2	1/7/15	0.231	U	0.416	0.0629	U	0.0956	0.131		0.0534	0.000	U	0.0398	0.204		0.0590
Duplicate of J1V2J2	J1V2K1	1/7/15	-0.0379	U	0.372	-0.0227	U	0.0856	0.119		0.0537	-0.000533	U	0.0485	0.147		0.0361
SZ-1	J1V2H9	1/7/15	0.131	U	0.398	0.0101	U	0.104	0.126		0.0639	-0.000635	U	0.0577	0.159		0.0430
SZ-2	J1V2J0	1/7/15	0.176	U	0.374	0.00491	U	0.110	0.242		0.0632	-0.000695	U	0.0632	0.208		0.0632
SZ-3	J1V2J1	1/7/15	-0.0670	U	0.414	0.113	U	0.122	0.160		0.0649	-0.000645	U	0.0587	0.0484		0.0437
SZ-5	J1V2J3	1/7/15	-0.00137	U	0.375	0.0116	U	0.0839	0.125		0.0507	0.0134	U	0.0507	0.153		0.0378
SZ-6	J1V2J4	1/7/15	0.00382	U	0.563	0.0729	U	0.120	0.113		0.0437	0.000	U	0.0437	0.161		0.0437
SZ-7	J1V2J5	1/7/15	0.425		0.359	0.0222	U	0.0884	0.199		0.0620	0.0444	U	0.0666	0.262		0.0418
SZ-8	J1V2J6	1/7/15	0.00967	U	0.418	0.0563	U	0.122	0.119		0.0605	-0.000601	U	0.0547	0.225		0.0407
SZ-9	J1V2J7	1/7/15	0.220	U	0.436	0.0424	U	0.0950	0.0971		0.0593	-0.000652	U	0.0593	0.179		0.0593
SZ-10	J1V2J8	1/7/15	0.550		0.436	0.0240	U	0.0998	0.144		0.0532	-0.000529	U	0.0481	0.198		0.0358
SZ-11	J1V2J9	1/7/15	0.0993	U	0.402	-0.0120	U	0.103	0.135		0.0688	-0.000684	U	0.0622	0.137		0.0463
SZ-12	J1V2K0	1/7/15	0.115	U	0.364	0.0572	U	0.114	0.227		0.0540	0.000	U	0.0363	0.147		0.0363
OB-1	J1V2L6	1/6/15	0.385		0.309	-0.0252	U	0.0902	0.134		0.0603	0.000	U	0.0406	0.164		0.0546
Duplicate of J1V2L6	J1V2M8	1/6/15	0.347		0.267	-0.00550	U	0.0830	0.109		0.0552	0.0132	U	0.0499	0.219		0.0372
OB-2	J1V2L7	1/6/15	0.223		0.200	-0.0540	U	0.0851	0.0875		0.0595	0.0148	U	0.0401	0.204		0.0708
OB-3	J1V2L8	1/6/15	0.206	U	0.231	0.0244	U	0.0981	0.268		0.0428	0.0316	U	0.0428	0.158		0.0428
OB-4	J1V2L9	1/6/15	0.243		0.242	0.0264	U	0.0963	0.312		0.0645	-0.000597	U	0.0544	0.179		0.0405
OB-5	J1V2M0	1/6/15	0.246		0.240	0.00714	U	0.0904	0.114		0.0522	0.0143	U	0.0389	0.142		0.0577
OB-6	J1V2M1	1/6/15	0.0131	U	0.260	0.00413	U	0.109	0.271		0.0609	-0.000605	U	0.0551	0.257		0.0410
OB-7	J1V2M2	1/6/15	0.114	U	0.252	-0.0287	U	0.0780	0.197		0.0410	0.0151	U	0.0410	0.151		0.0410
OB-8	J1V2M3	1/6/15	0.709		0.383	-0.0101	U	0.105	0.106		0.0536	-0.00160	U	0.0576	0.147		0.0361
OB-9	J1V2M4	1/6/15	0.338		0.219	0.0199	U	0.0902	0.228		0.0551	0.000	U	0.0346	0.229		0.0465
OB-10	J1V2M5	1/6/15	0.263		0.257	0.0268	U	0.108	0.244		0.0495	-0.000544	U	0.0495	0.136		0.0369
OB-11	J1V2M6	1/6/15	0.234		0.227	0.0354	U	0.0848	0.107		0.0362	0.000	U	0.0362	0.187		0.0362
OB-12	J1V2M7	1/6/15	0.234		0.228	-0.00277	U	0.0798	0.110		0.0557	0.0133	U	0.0504	0.124		0.0504
DZ-5	J1V2K7	1/7/15	0.230	U	0.406	0.0735	UJ	0.0937	0.118		0.0652	0.0112	UJ	0.0491	0.228	J	0.0631
Duplicate of J1V2K7	J1V2L5	1/7/15	0.390		0.388	0.0111	UJ	0.0949	0.286	J	0.0619	0.0102	UJ	0.0501	0.251	J	0.0637
DZ-1	J1V2K3	1/7/15	0.122	U	0.408	0.0520	UJ	0.232	0.186		0.0943	0.0205	UJ	0.0687	0.166	J	0.0818
DZ-2	J1V2K4	1/7/15	0.0304	U	0.363	0.0430	UJ	0.0900	0.146		0.0653	0.0333	UJ	0.0499	0.230	J	0.0499
DZ-3	J1V2K5	1/7/15	0.0568	U	0.441	0.0473	UJ	0.0857	0.169		0.0928	0.0233	UJ	0.0490	0.212	J	0.0753
DZ-4	J1V2K6	1/7/15	0.307	U	0.450	0.0198	UJ	0.114	0.150		0.0654	-0.00143	UJ	0.0514	0.177	J	0.0514
DZ-6	J1V2K8	1/7/15	0.0332	U	0.376	0.0614	UJ	0.0895	0.262		0.0954	0.0164	UJ	0.0719	0.334	J	0.0954
DZ-7	J1V2K9	1/7/15	0.0245	U	0.404	0.0796	UJ	0.0932	0.0888	U	0.117	-0.00276	UJ	0.0661	0.124	J	0.102
DZ-8	J1V2L0	1/7/15	0.0893	U	0.369	0.0469	UJ	0.0905	0.0985		0.0633	-0.00153	UJ	0.0549	0.189	J	0.0511
DZ-9	J1V2L1	1/7/15	0.00978	U	0.423	-0.00422	UJ	0.0912	0.220		0.0687	0.0110	UJ	0.0540	0.220	J	0.0706
DZ-10	J1V2L2	1/7/15	0.0919	U	0.372	0.0352	UJ	0.0986	0.176		0.0954	-0.00455	UJ	0.0695	0.167	J	0.0855
DZ-11	J1V2L3	1/7/15	0.854		0.358	0.0621	UJ	0.109	0.176		0.106	0.0257	UJ	0.0591	0.156	J	0.0864
DZ-12	J1V2L4	1/7/15	0.150	U	0.388	0.0522	UJ	0.111	0.149		0.0582	0.0103	UJ	0.0504	0.151	J	0.0470

Attachment	1	Sheet No.	3 of 23
Originator	J. D. Skoglie	Date	3/10/15
Checked	I. B. Berezovskiy	Date	3/10/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	5970	X	1.5	0.38	U	0.38	2.8		0.66	61.6	X	0.076	0.033	U	0.033
Duplicate of J1V2J2	J1V2K1	1/7/15	6210	X	1.5	0.36	U	0.36	3.3		0.63	62.9	X	0.072	0.031	U	0.031
SZ-1	J1V2H9	1/7/15	6850	X	1.6	0.40	U	0.40	2.5		0.69	64.5	X	0.080	0.035	U	0.035
SZ-2	J1V2J0	1/7/15	8000	X	1.6	0.38	U	0.38	3.8		0.66	66.3	X	0.076	0.033	U	0.033
SZ-3	J1V2J1	1/7/15	6180	X	1.6	0.40	U	0.40	3.7		0.70	66.3	X	0.081	0.035	U	0.035
SZ-5	J1V2J3	1/7/15	3750	X	1.5	1.8	U	1.8	1.8		0.63	80.4	X	0.073	0.16	U	0.16
SZ-6	J1V2J4	1/7/15	5350	X	1.6	0.38	U	0.38	2.6		0.66	57.9	X	0.076	0.033	U	0.033
SZ-7	J1V2J5	1/7/15	5820	X	1.5	0.72	U	0.72	2.7		0.62	64.7	X	0.072	0.062	U	0.062
SZ-8	J1V2J6	1/7/15	4850	X	1.4	0.69	U	0.69	2.7		0.60	45.9	X	0.069	0.060	U	0.060
SZ-9	J1V2J7	1/7/15	6090	X	1.4	0.35	U	0.35	4.5		0.61	77.8	X	0.070	0.061	U	0.061
SZ-10	J1V2J8	1/7/15	5370	X	1.5	0.37	U	0.37	2.8		0.64	61.8	X	0.074	0.064	U	0.064
SZ-11	J1V2J9	1/7/15	6110	X	1.6	0.77	U	0.77	2.8		0.67	72.5	X	0.077	0.033	U	0.033
SZ-12	J1V2K0	1/7/15	7690	X	1.6	0.80	U	0.80	3.4		0.70	72.6	X	0.080	0.035	U	0.035
OB-1	J1V2L6	1/6/15	5260	X	1.5	0.72	U	0.72	2.1		0.62	58.3	X	0.072	0.062	U	0.062
Duplicate of J1V2L6	J1V2M8	1/6/15	5190	X	1.5	1.8	U	1.8	2.4		0.62	54.6	X	0.072	0.16	U	0.16
OB-2	J1V2L7	1/6/15	5560	X	1.5	0.71	U	0.71	2.7		0.62	64.4	X	0.071	0.031	U	0.031
OB-3	J1V2L8	1/6/15	5510	X	1.4	0.69	U	0.69	2.3		0.60	52.8	X	0.069	0.030	U	0.030
OB-4	J1V2L9	1/6/15	7210	X	1.5	0.73	U	0.73	4.2		0.63	71.2	X	0.073	0.032	U	0.032
OB-5	J1V2M0	1/6/15	5240	X	1.6	0.77	U	0.77	2.0		0.67	54.3	X	0.077	0.033	U	0.033
OB-6	J1V2M1	1/6/15	4910	X	1.7	0.41	U	0.41	2.1		0.71	56.8	X	0.082	0.036	U	0.036
OB-7	J1V2M2	1/6/15	4980	X	1.6	0.39	U	0.39	2.3		0.68	57.3	X	0.079	0.034	U	0.034
OB-8	J1V2M3	1/6/15	5670	X	1.5	0.72	U	0.72	2.4		0.63	76.6	X	0.072	0.031	U	0.031
OB-9	J1V2M4	1/6/15	5410	X	1.4	0.69	U	0.69	2.4		0.60	60.0	X	0.069	0.030	U	0.030
OB-10	J1V2M5	1/6/15	5050	X	1.6	2.0	U	2.0	2.1		0.68	59.7	X	0.079	0.034	U	0.034
OB-11	J1V2M6	1/6/15	4710	X	1.5	0.75	U	0.75	2.7		0.65	63.5	X	0.075	0.032	U	0.032
OB-12	J1V2M7	1/6/15	5770	X	1.6	0.80	U	0.80	1.9		0.70	69.3	X	0.080	0.035	U	0.035
DZ-5	J1V2K7	1/7/15	3750	X	1.4	0.68	UJ	0.68	1.5	J	0.59	63.1	X	0.068	0.059	U	0.059
Duplicate of J1V2K7	J1V2L5	1/7/15	3830	X	1.4	0.70	UJ	0.70	1.6	J	0.61	66.8	X	0.070	0.061	U	0.061
DZ-1	J1V2K3	1/7/15	3830	X	1.4	0.68	UJ	0.68	1.5	NJ	0.59	64.4	X	0.068	0.059	U	0.059
DZ-2	J1V2K4	1/7/15	4300	X	1.4	0.70	UJ	0.70	1.5	J	0.61	53.3	X	0.070	0.061	U	0.061
DZ-3	J1V2K5	1/7/15	4400	X	1.6	0.77	UJ	0.77	1.4	J	0.67	72.1	X	0.077	0.067	U	0.067
DZ-4	J1V2K6	1/7/15	4230	X	1.4	0.71	UJ	0.71	1.6	J	0.61	66.0	X	0.071	0.061	U	0.061
DZ-6	J1V2K8	1/7/15	4240	X	1.6	0.78	UJ	0.78	2.1	J	0.68	213	X	0.078	0.068	U	0.068
DZ-7	J1V2K9	1/7/15	4130	X	1.5	0.73	UJ	0.73	1.8	J	0.64	58.5	X	0.073	0.064	U	0.064
DZ-8	J1V2L0	1/7/15	4110	X	1.4	0.68	UJ	0.68	1.9	J	0.59	59.2	X	0.068	0.059	U	0.059
DZ-9	J1V2L1	1/7/15	3610	X	1.4	0.70	UJ	0.70	1.6	J	0.61	58.0	X	0.070	0.061	U	0.061
DZ-10	J1V2L2	1/7/15	3790	X	1.5	0.73	UJ	0.73	1.4	J	0.63	63.9	X	0.073	0.063	U	0.063
DZ-11	J1V2L3	1/7/15	5360	X	1.5	0.36	UJ	0.36	2.8	J	0.62	58.5	X	0.072	0.031	U	0.031
DZ-12	J1V2L4	1/7/15	4630	X	1.6	0.40	UJ	0.40	2.4	J	0.69	61.2	X	0.079	0.034	U	0.034
Equipment Blank	J1V2M9	1/6/15	112	X	1.4	0.34	U	0.34	0.59	U	0.59	1.1	X	0.068	0.030	U	0.030
Equipment Blank	J1V2K2	1/7/15	202	X	1.4	0.33	U	0.33	1.1		0.58	1.7	X	0.067	0.13	B	0.029

Attachment	1	Sheet No.	4 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	1.0	B	0.98	0.14	B	0.041	7380	X	14.0	8.9	X	0.058	6.8	X	0.10
Duplicate of J1V2J2	J1V2K1	1/7/15	0.95	B	0.93	0.12	B	0.039	7750	X	13.4	9.9	X	0.055	7.2	X	0.095
SZ-1	J1V2H9	1/7/15	1.2	B	1.0	0.11	B	0.043	6160	X	14.8	7.9	X	0.061	7.5	X	0.10
SZ-2	J1V2J0	1/7/15	0.98	U	0.98	0.11	B	0.041	7220	X	14.1	9.1	X	0.058	9.1	X	0.10
SZ-3	J1V2J1	1/7/15	1.1	B	1.0	0.14	B	0.044	10200	X	15.0	7.7	X	0.062	8.3	X	0.11
SZ-5	J1V2J3	1/7/15	0.94	U	0.94	0.10	B	0.039	6480	X	13.5	4.3	X	0.056	11.1	X	0.48
SZ-6	J1V2J4	1/7/15	0.99	U	0.99	0.11	B	0.041	6320	X	14.2	6.5	X	0.058	7.6	X	0.10
SZ-7	J1V2J5	1/7/15	0.92	U	0.92	0.13	B	0.039	7670	X	13.3	7.0	X	0.055	8.3	X	0.094
SZ-8	J1V2J6	1/7/15	0.89	U	0.89	0.13	B	0.037	6830	X	12.9	6.9	X	0.053	8.3	X	0.091
SZ-9	J1V2J7	1/7/15	1.1	B	0.9	0.16	B	0.038	13100	X	13.0	6.1	X	0.053	7.6	X	0.092
SZ-10	J1V2J8	1/7/15	0.96	U	0.96	0.13	B	0.040	8020	X	13.8	6.6	X	0.057	8.1	X	0.098
SZ-11	J1V2J9	1/7/15	0.99	U	0.99	0.11	B	0.042	5970	X	14.3	7.6	X	0.059	9.4	X	0.10
SZ-12	J1V2K0	1/7/15	1.0	U	1.0	0.14	B	0.043	8230	X	14.9	10.3	X	0.061	9.2	X	0.11
OB-1	J1V2L6	1/6/15	0.93	U	0.93	0.13	B	0.039	6990	X	13.3	5.8	X	0.055	9.0		0.19
Duplicate of J1V2L6	J1V2M8	1/6/15	0.92	U	0.92	0.13	B	0.039	6520	X	13.3	7.4	X	0.055	8.4		0.094
OB-2	J1V2L7	1/6/15	0.92	U	0.92	0.16	B	0.039	7090	X	13.2	8.0	X	0.054	8.5		0.094
OB-3	J1V2L8	1/6/15	0.89	U	0.89	0.14	B	0.037	6990	X	12.8	7.5	X	0.053	7.7		0.091
OB-4	J1V2L9	1/6/15	0.94	U	0.94	0.16	B	0.039	8240	X	13.5	8.9	X	0.055	8.1		0.096
OB-5	J1V2M0	1/6/15	0.99	U	0.99	0.15	B	0.042	6570	X	14.3	7.0	X	0.059	8.4		0.10
OB-6	J1V2M1	1/6/15	1.1	U	1.1	0.11	B	0.044	6210	X	15.2	7.8	X	0.063	6.9		0.11
OB-7	J1V2M2	1/6/15	1.0	U	1.0	0.13	B	0.042	6240	X	14.6	6.4	X	0.060	7.6		0.10
OB-8	J1V2M3	1/6/15	0.93	U	0.93	0.15	B	0.039	8200	X	13.4	7.4	X	0.055	8.0		0.095
OB-9	J1V2M4	1/6/15	0.89	U	0.89	0.14	B	0.037	8530	X	12.8	7.5	X	0.053	8.3		0.091
OB-10	J1V2M5	1/6/15	1.0	U	1.0	0.14	B	0.043	6950	X	14.6	5.8	X	0.060	7.7		0.10
OB-11	J1V2M6	1/6/15	0.96	U	0.96	0.14	B	0.040	6990	X	13.8	5.5	X	0.057	8.6		0.098
OB-12	J1V2M7	1/6/15	1.0	U	1.0	0.16	B	0.043	7900	X	14.9	7.4	X	0.061	8.8		0.11
DZ-5	J1V2K7	1/7/15	0.88	UJ	0.88	0.11	B	0.037	6130	X	12.6	4.3	X	0.052	9.7	X	0.18
Duplicate of J1V2K7	J1V2L5	1/7/15	0.91	UJ	0.91	0.10	B	0.038	6360	X	13.0	3.6	X	0.054	9.9	X	0.18
DZ-1	J1V2K3	1/7/15	0.88	UJN	0.88	0.11	B	0.037	7060	X	12.6	3.4	X	0.052	9.6	X	0.18
DZ-2	J1V2K4	1/7/15	0.91	UJ	0.91	0.11	B	0.038	6320	X	13.0	3.6	X	0.054	9.7	X	0.19
DZ-3	J1V2K5	1/7/15	0.99	UJ	0.99	0.13	B	0.041	7180	X	14.2	3.8	X	0.059	10.1	X	0.20
DZ-4	J1V2K6	1/7/15	0.91	UJ	0.91	0.11	B	0.038	6450	X	13.1	3.9	X	0.054	9.9	X	0.19
DZ-6	J1V2K8	1/7/15	1.0	UJ	1.0	0.12	B	0.042	6970	X	14.5	3.7	X	0.060	10.3	X	0.21
DZ-7	J1V2K9	1/7/15	0.95	UJ	0.95	0.12	B	0.040	6450	X	13.6	3.9	X	0.056	9.2	X	0.19
DZ-8	J1V2L0	1/7/15	0.88	UJ	0.88	0.11	B	0.037	5590	X	12.6	4.2	X	0.052	8.8	X	0.18
DZ-9	J1V2L1	1/7/15	0.91	UJ	0.91	0.11	B	0.038	5570	X	13.0	3.9	X	0.054	9.4	X	0.18
DZ-10	J1V2L2	1/7/15	0.94	UJ	0.94	0.10	B	0.039	6130	X	13.5	3.7	X	0.055	9.9	X	0.19
DZ-11	J1V2L3	1/7/15	0.93	UJ	0.93	0.12	B	0.039	8100	X	13.3	6.7	X	0.055	7.9	X	0.095
DZ-12	J1V2L4	1/7/15	1.0	UJ	1.0	0.10	B	0.043	9080	X	14.7	6.2	X	0.061	7.2	X	0.10
Equipment Blank	J1V2M9	1/6/15	0.88	U	0.88	0.037	U	0.037	34.5	BCX	12.6	0.18	X	0.052	0.089	U	0.089
Equipment Blank	J1V2K2	1/7/15	0.86	U	0.86	0.036	U	0.036	47.4	CX	12.4	0.37	X	0.051	0.28	BX	0.088

Attachment	1	Sheet No.	5 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Copper			Hexavalent Chromium			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	13.1	X	0.22	0.200		0.155	18500	X	3.8	3.7		0.27	4210	X	3.7
Duplicate of J1V2J2	J1V2K1	1/7/15	13.9	X	0.21	0.180		0.155	19500	X	3.6	4.1		0.26	4770	X	3.5
SZ-1	J1V2H9	1/7/15	13.6	X	0.23	0.317		0.155	21500	X	4.0	4.4		0.28	4490	X	3.9
SZ-2	J1V2J0	1/7/15	18.7	X	0.22	0.323		0.155	24000	X	3.8	5.4		0.27	5850	X	3.7
SZ-3	J1V2J1	1/7/15	14.5	X	0.23	0.209		0.155	22900	X	4.0	4.7		0.29	4730	X	3.9
SZ-5	J1V2J3	1/7/15	16.0	X	1.0	0.155	U	0.155	26200	X	3.6	3.2		1.3	4030	X	3.5
SZ-6	J1V2J4	1/7/15	12.7	X	0.22	0.249		0.155	21200	X	3.8	3.9		0.27	4140	X	3.7
SZ-7	J1V2J5	1/7/15	15.1	X	0.20	0.202		0.155	23800	X	3.6	5.0		0.25	4490	X	3.5
SZ-8	J1V2J6	1/7/15	13.8	X	0.20	0.180		0.155	25900	X	3.5	4.1		0.25	4550	X	3.4
SZ-9	J1V2J7	1/7/15	14.9	X	0.20	0.286		0.155	21200	X	3.5	6.8		0.25	4350	X	3.4
SZ-10	J1V2J8	1/7/15	14.1	X	0.21	0.245		0.155	23400	X	3.7	5.4		0.26	4170	X	3.6
SZ-11	J1V2J9	1/7/15	15.7	X	0.22	0.246		0.155	24900	X	3.9	4.1		0.27	5230	X	3.8
SZ-12	J1V2K0	1/7/15	17.4	X	0.23	0.272		0.155	24400	X	4.0	5.2		0.29	5600	X	3.9
OB-1	J1V2L6	1/6/15	15.0		0.41	0.155	U	0.155	22800	X	3.6	5.1		0.51	4450	X	3.5
Duplicate of J1V2L6	J1V2M8	1/6/15	14.1		0.20	0.155	U	0.155	24900	X	3.6	4.8		0.25	4760	X	3.5
OB-2	J1V2L7	1/6/15	13.7		0.20	0.213		0.155	23400	X	3.6	5.8		0.25	4510	X	3.5
OB-3	J1V2L8	1/6/15	14.0		0.20	0.155	U	0.155	20500	X	3.4	4.7		0.25	4280	X	3.4
OB-4	J1V2L9	1/6/15	14.4		0.21	0.155	U	0.155	22500	X	3.6	9.4		0.26	4840	X	3.5
OB-5	J1V2M0	1/6/15	13.7		0.22	0.168		0.155	22900	X	3.9	5.0		0.27	4500	X	3.8
OB-6	J1V2M1	1/6/15	12.5		0.23	0.155	U	0.155	18300	X	4.1	2.8		0.29	4370	X	4.0
OB-7	J1V2M2	1/6/15	12.1		0.22	0.155	U	0.155	20900	X	3.9	4.9		0.28	4140	X	3.8
OB-8	J1V2M3	1/6/15	14.3		0.21	0.214		0.155	22300	X	3.6	6.0		0.26	4370	X	3.5
OB-9	J1V2M4	1/6/15	13.9		0.20	0.155	U	0.155	23100	X	3.4	5.7		0.25	4470	X	3.4
OB-10	J1V2M5	1/6/15	14.1		0.23	0.212		0.155	19600	X	3.9	4.5		0.28	4260	X	3.8
OB-11	J1V2M6	1/6/15	12.9		0.21	0.214		0.155	23800	X	3.7	3.9		0.27	4100	X	3.6
OB-12	J1V2M7	1/6/15	14.3		0.23	0.169		0.155	23800	X	4.0	5.6		0.29	4690	X	3.9
DZ-5	J1V2K7	1/7/15	13.1		0.39	0.155	U	0.155	28200		6.8	2.3		0.48	4130	X	3.3
Duplicate of J1V2K7	J1V2L5	1/7/15	14.1		0.40	0.155	U	0.155	30100		7.0	2.7		0.50	4170	X	3.4
DZ-1	J1V2K3	1/7/15	14.0		0.39	0.155	U	0.155	28800		6.8	2.4		0.48	4170	X	3.3
DZ-2	J1V2K4	1/7/15	14.8		0.40	0.230		0.155	28700		7.0	3.0		0.50	4140	X	3.4
DZ-3	J1V2K5	1/7/15	15.0		0.44	0.155	U	0.155	30600		7.7	2.7		0.54	4570	X	3.7
DZ-4	J1V2K6	1/7/15	14.2		0.40	0.155	U	0.155	30300		7.1	2.6		0.50	4210	X	3.4
DZ-6	J1V2K8	1/7/15	14.4		0.45	0.155	U	0.155	30600		7.8	3.0		0.56	4490	X	3.8
DZ-7	J1V2K9	1/7/15	13.1		0.42	0.155	U	0.155	29700		7.3	2.6		0.52	4100	X	3.6
DZ-8	J1V2L0	1/7/15	14.0		0.39	0.194		0.155	26100		6.8	3.2		0.48	3920	X	3.3
DZ-9	J1V2L1	1/7/15	12.7		0.40	0.155	U	0.155	28400		7.0	2.6		0.50	4060	X	3.4
DZ-10	J1V2L2	1/7/15	14.0		0.41	0.155	U	0.155	29600		7.3	2.5		0.52	4080	X	3.5
DZ-11	J1V2L3	1/7/15	13.3		0.21	0.155	U	0.155	23400		3.6	6.2		0.26	4280	X	3.5
DZ-12	J1V2L4	1/7/15	12.2		0.23	0.155	U	0.155	21700		4.0	4.1		0.28	3950	X	3.9
Equipment Blank	J1V2M9	1/6/15	0.34	B	0.19				163	X	3.4	0.24	U	0.24	16.5	BCX	3.3
Equipment Blank	J1V2K2	1/7/15	1.2	XC	0.19				1690	X	3.3	0.38	B	0.24	47.8	X	3.2

Attachment	1	Sheet No.	6 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Manganese			Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	281	X	0.10	0.0055	U	0.0055	0.26	U	0.26	9.6	X	0.12	956		40.8
Duplicate of J1V2J2	J1V2K1	1/7/15	293	X	0.095	0.010	B	0.0056	0.25	U	0.25	11.8	X	0.12	1000		39.0
SZ-1	J1V2H9	1/7/15	287	X	0.10	0.0087	B	0.0058	0.27	U	0.27	11.1	X	0.13	1010		42.9
SZ-2	J1V2J0	1/7/15	355	X	0.10	0.0053	U	0.0053	0.26	U	0.26	11.7	X	0.12	1390		41.1
SZ-3	J1V2J1	1/7/15	313	X	0.11	0.023		0.0058	0.28	U	0.28	10.2	X	0.13	1000		43.6
SZ-5	J1V2J3	1/7/15	384	X	0.096	0.0057	U	0.0057	0.25	U	0.25	7.2	X	0.12	508		39.3
SZ-6	J1V2J4	1/7/15	292	X	0.10	0.011	BM	0.0053	0.26	U	0.26	8.8	X	0.12	893		41.2
SZ-7	J1V2J5	1/7/15	317	X	0.094	0.10		0.0054	0.25	U	0.25	9.3	X	0.12	975		38.6
SZ-8	J1V2J6	1/7/15	310	X	0.091	0.44		0.0058	0.32	B	0.24	8.9	X	0.11	688		37.4
SZ-9	J1V2J7	1/7/15	282	X	0.092	0.29		0.0052	0.24	U	0.24	8.5	X	0.11	920		37.8
SZ-10	J1V2J8	1/7/15	295	X	0.098	0.28		0.0057	0.25	U	0.25	8.3	X	0.12	845		40.1
SZ-11	J1V2J9	1/7/15	355	X	0.10	0.0054	U	0.0054	0.26	U	0.26	10.9	X	0.12	1060		41.6
SZ-12	J1V2K0	1/7/15	382	X	0.11	0.0080	B	0.0053	0.28	U	0.28	11.5	X	0.13	1310		43.4
OB-1	J1V2L6	1/6/15	304	X	0.095	0.30		0.0054	0.25	U	0.25	9.0	X	0.12	822		38.8
Duplicate of J1V2L6	J1V2M8	1/6/15	316	X	0.094	0.30		0.0052	0.24	U	0.24	12.7	X	0.12	800		38.6
OB-2	J1V2L7	1/6/15	325	X	0.094	0.084		0.0058	0.27	B	0.24	9.7	X	0.12	956		38.5
OB-3	J1V2L8	1/6/15	270	X	0.091	0.35		0.0057	0.24	U	0.24	10.9	X	0.11	798		37.2
OB-4	J1V2L9	1/6/15	323	X	0.096	0.011	B	0.0057	0.25	U	0.25	11.8	X	0.12	1170		39.2
OB-5	J1V2M0	1/6/15	309	X	0.10	0.11		0.0052	0.26	U	0.26	9.5	X	0.12	810		41.6
OB-6	J1V2M1	1/6/15	278	X	0.11	0.050		0.0054	0.28	U	0.28	10.9	X	0.13	735		44.2
OB-7	J1V2M2	1/6/15	287	X	0.10	0.12		0.0056	0.27	U	0.27	8.1	X	0.13	813		42.4
OB-8	J1V2M3	1/6/15	311	X	0.095	0.22		0.0055	0.25	U	0.25	10	X	0.12	899		39.0
OB-9	J1V2M4	1/6/15	307	X	0.091	0.13		0.0055	0.24	U	0.24	9.2	X	0.11	864		37.2
OB-10	J1V2M5	1/6/15	300	X	0.10	0.070	M	0.0052	0.27	U	0.27	7.7	X	0.13	733		42.5
OB-11	J1V2M6	1/6/15	331	X	0.098	0.084		0.0055	0.26	U	0.26	9.6	X	0.12	750		40.3
OB-12	J1V2M7	1/6/15	372	X	0.11	0.092		0.0056	0.27	U	0.27	9.7	X	0.13	946		43.4
DZ-5	J1V2K7	1/7/15	295	X	0.089	0.0053	U	0.0053	0.23	U	0.23	6.3	X	0.11	450		36.7
Duplicate of J1V2K7	J1V2L5	1/7/15	300	X	0.092	0.0054	U	0.0054	0.24	U	0.24	8.0	X	0.11	472		37.9
DZ-1	J1V2K3	1/7/15	295	X	0.089	0.0057	U	0.0057	0.23	UN	0.23	6.4	X	0.11	476		36.7
DZ-2	J1V2K4	1/7/15	302	X	0.093	0.0050	U	0.0050	0.24	U	0.24	6.8	X	0.11	533		37.9
DZ-3	J1V2K5	1/7/15	315	X	0.10	0.015	B	0.0057	0.26	U	0.26	8.0	X	0.12	543		41.4
DZ-4	J1V2K6	1/7/15	306	X	0.093	0.0051	U	0.0051	0.24	U	0.24	7.0	X	0.11	505		38.2
DZ-6	J1V2K8	1/7/15	306	X	0.10	0.0054	U	0.0054	0.27	U	0.27	8.1	X	0.13	526		42.2
DZ-7	J1V2K9	1/7/15	289	X	0.096	0.0057	U	0.0057	0.25	U	0.25	6.8	X	0.12	520		39.5
DZ-8	J1V2L0	1/7/15	305	X	0.089	0.0056	U	0.0056	0.23	U	0.23	6.8	X	0.11	624		36.6
DZ-9	J1V2L1	1/7/15	299	X	0.092	0.0053	U	0.0053	0.24	U	0.24	8.5	X	0.11	447		37.9
DZ-10	J1V2L2	1/7/15	285	X	0.096	0.0051	U	0.0051	0.25	U	0.25	8.3	X	0.12	453		39.2
DZ-11	J1V2L3	1/7/15	289	X	0.095	0.30		0.0054	0.25	U	0.25	8.9	X	0.12	860		38.8
DZ-12	J1V2L4	1/7/15	283	X	0.10	0.061		0.0053	0.27	U	0.27	9.0	X	0.13	732		42.8
Equipment Blank	J1V2M9	1/6/15	2.9	X	0.089	0.0050	U	0.0050	0.23	U	0.23	0.16	BCX	0.11	36.7	U	36.7
Equipment Blank	J1V2K2	1/7/15	5.9	X	0.088	0.0052	U	0.0052	0.23	U	0.23	0.8	BX	0.11	60.0	B	36.0

Attachment	1	Sheet No.	7 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-4	J1V2J2	1/7/15	0.86	U	0.86	373		5.6	0.16	U	0.16	251		58.8	48.1	X	0.094
Duplicate of J1V2J2	J1V2K1	1/7/15	0.82	U	0.82	368		5.4	0.15	U	0.15	244		56.1	50.0	X	0.089
SZ-1	J1V2H9	1/7/15	0.90	U	0.90	250	N	5.9	0.17	U	0.17	293		61.8	54.6	X	0.098
SZ-2	J1V2J0	1/7/15	0.86	U	0.86	337		5.7	0.16	U	0.16	361		59.1	57.1	X	0.094
SZ-3	J1V2J1	1/7/15	0.91	U	0.91	374		6.0	0.17	U	0.17	412		62.7	61.6	X	0.10
SZ-5	J1V2J3	1/7/15	0.82	U	0.82	112		5.4	0.15	U	0.15	321		56.6	91.3	X	0.45
SZ-6	J1V2J4	1/7/15	0.87	U	0.87	287		5.7	0.16	U	0.16	262		59.4	55.1	X	0.095
SZ-7	J1V2J5	1/7/15	0.81	U	0.81	360		5.3	0.15	U	0.15	316		55.6	63.5	X	0.089
SZ-8	J1V2J6	1/7/15	0.78	U	0.78	268		5.2	0.15	U	0.15	328		53.8	60.3	X	0.086
SZ-9	J1V2J7	1/7/15	0.79	U	0.79	281		5.2	0.15	U	0.15	393		54.3	55.5	X	0.087
SZ-10	J1V2J8	1/7/15	0.84	U	0.84	265		5.5	0.16	U	0.16	394		57.6	66.5	X	0.092
SZ-11	J1V2J9	1/7/15	0.87	U	0.87	300		5.7	0.16	U	0.16	304		59.9	64.2	X	0.095
SZ-12	J1V2K0	1/7/15	0.91	U	0.91	344		6.0	0.17	U	0.17	420		62.4	61.5	X	0.099
OB-1	J1V2L6	1/6/15	0.81	U	0.81	331	N	5.4	0.15	U	0.15	324		55.8	63.8		0.18
Duplicate of J1V2L6	J1V2M8	1/6/15	0.81	U	0.81	181	N	5.3	0.15	U	0.15	277		55.6	61.5		0.089
OB-2	J1V2L7	1/6/15	0.81	U	0.81	283	N	5.3	0.15	U	0.15	311		55.4	65.3		0.088
OB-3	J1V2L8	1/6/15	0.78	U	0.78	249	N	5.1	0.15	U	0.15	368		53.6	56.2		0.085
OB-4	J1V2L9	1/6/15	0.82	U	0.82	273	N	5.4	0.15	U	0.15	296		56.4	56.6		0.090
OB-5	J1V2M0	1/6/15	0.87	U	0.87	297	N	5.7	0.16	U	0.16	287		59.8	62.6		0.095
OB-6	J1V2M1	1/6/15	0.93	U	0.93	282	N	6.1	0.17	U	0.17	251		63.7	50.0		0.10
OB-7	J1V2M2	1/6/15	0.89	U	0.89	293	N	5.9	0.17	U	0.17	266		61.0	56.6		0.097
OB-8	J1V2M3	1/6/15	0.82	U	0.82	285	N	5.4	0.15	U	0.15	327		56.2	62.6		0.090
OB-9	J1V2M4	1/6/15	0.78	U	0.78	299	N	5.1	0.15	U	0.15	300		53.6	64.5		0.085
OB-10	J1V2M5	1/6/15	0.89	U	0.89	280	N	5.9	0.17	U	0.17	278		61.2	64.5		0.097
OB-11	J1V2M6	1/6/15	0.84	U	0.84	278	N	5.6	0.16	U	0.16	261		57.9	53.8		0.092
OB-12	J1V2M7	1/6/15	0.91	U	0.91	347	N	6.0	0.17	U	0.17	303		62.4	65.5		0.099
DZ-5	J1V2K7	1/7/15	0.77	UJ	0.77	102	J	5.1	0.14	U	0.14	336		52.8	82.0		0.17
Duplicate of J1V2K7	J1V2L5	1/7/15	0.80	UJ	0.80	103	J	5.2	0.15	U	0.15	344		54.5	92.4		0.17
DZ-1	J1V2K3	1/7/15	0.77	UJN	0.77	92	J	5.1	0.14	U	0.14	332		52.7	81.1		0.17
DZ-2	J1V2K4	1/7/15	0.80	UJ	0.80	124	J	5.2	0.15	U	0.15	434		54.6	80.7		0.17
DZ-3	J1V2K5	1/7/15	0.87	UJ	0.87	146	J	5.7	0.16	U	0.16	338		59.5	85.9		0.19
DZ-4	J1V2K6	1/7/15	0.80	UJ	0.80	118	J	5.3	0.15	U	0.15	373		54.9	87.6		0.17
DZ-6	J1V2K8	1/7/15	0.88	UJ	0.88	123	J	5.8	0.16	U	0.16	351		60.7	88.6		0.19
DZ-7	J1V2K9	1/7/15	0.83	UJ	0.83	113	J	5.5	0.15	U	0.15	321		56.9	86.9		0.18
DZ-8	J1V2L0	1/7/15	0.77	UJ	0.77	209	J	5.1	0.14	U	0.14	313		52.7	72.2		0.17
DZ-9	J1V2L1	1/7/15	0.80	UJ	0.80	110	J	5.2	0.15	U	0.15	285		54.6	88.2		0.17
DZ-10	J1V2L2	1/7/15	0.82	UJ	0.82	102	J	5.4	0.15	U	0.15	306		56.4	87.0		0.18
DZ-11	J1V2L3	1/7/15	0.81	UJ	0.81	221	J	5.4	0.15	U	0.15	348		55.8	61.6		0.089
DZ-12	J1V2L4	1/7/15	0.90	UJ	0.90	310	J	5.9	0.17	U	0.17	274		61.6	52.8		0.098
Equipment Blank	J1V2M9	1/6/15	0.77	U	0.77	89.8	N	5.1	0.14	U	0.14	52.7	U	52.7	0.21	B	0.084
Equipment Blank	J1V2K2	1/7/15	0.75	U	0.75	86.9		5.0	0.14	U	0.14	51.8	U	51.8	1.7	BX	0.082

Attachment	1	Sheet No.	8 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Metals, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Zinc			TPH - Diesel Range EXT			TPH - Diesel Range			Percent moisture (wet sample)		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	%	Q	PQL
SZ-4	J1V2J2	1/7/15	36.1	X	0.40	6700		1000	2800	J	690	5.3		0.10
Duplicate of J1V2J2	J1V2K1	1/7/15	37.7	X	0.38	5300		1000	2300	J	680	5.3		0.10
SZ-1	J1V2H9	1/7/15	43.0	X	0.42	5600		990	2500	J	670	8.2		0.10
SZ-2	J1V2J0	1/7/15	49.5	X	0.40	2600	J	1000	960	J	700	8.5		0.10
SZ-3	J1V2J1	1/7/15	47.0	X	0.42	8300		1000	3900	J	690	9.5		0.10
SZ-5	J1V2J3	1/7/15	45.3	X	0.38	950	U	950	650	U	650	4.3		0.10
SZ-6	J1V2J4	1/7/15	39.1	X	0.40	27000		1000	9900		700	7.1		0.10
SZ-7	J1V2J5	1/7/15	44.4	X	0.38	12000		1000	4500		700	6.1		0.10
SZ-8	J1V2J6	1/7/15	42.3	X	0.36	4200		1000	1800	J	680	5.5		0.10
SZ-9	J1V2J7	1/7/15	50.1	X	0.37	21000		1000	8700		690	5.6		0.10
SZ-10	J1V2J8	1/7/15	44.6	X	0.39	24000		970	11000		660	5.2		0.10
SZ-11	J1V2J9	1/7/15	45.8	X	0.40	1000	U	1000	700	U	700	7.0		0.10
SZ-12	J1V2K0	1/7/15	48.5	X	0.42	1100	U	1100	720	U	720	7.4		0.10
OB-1	J1V2L6	1/6/15	42.7	X	0.38	6400		1000	3400	J	700	4.8		0.10
Duplicate of J1V2L6	J1V2M8	1/6/15	41.3	X	0.38	13000		1000	6300		710	5.2		0.10
OB-2	J1V2L7	1/6/15	46.7	X	0.37	8400		1000	4300		680	5.8		0.10
OB-3	J1V2L8	1/6/15	40.6	X	0.36	8500		1000	4100		690	5.0		0.10
OB-4	J1V2L9	1/6/15	43.5	X	0.38	4700		1100	2200	J	720	7.5		0.10
OB-5	J1V2M0	1/6/15	43.8	X	0.40	8100		1000	5300		700	5.2		0.10
OB-6	J1V2M1	1/6/15	35.9	X	0.43	1600	J	1100	900	J	730	8.2		0.10
OB-7	J1V2M2	1/6/15	40.6	X	0.41	6600		1000	3400	J	690	5.2		0.10
OB-8	J1V2M3	1/6/15	46.2	X	0.38	22000		990	14000		670	6.2		0.10
OB-9	J1V2M4	1/6/15	45.5	X	0.36	12000		1000	5000		690	5.8		0.10
OB-10	J1V2M5	1/6/15	43.8	X	0.41	8100		980	4000		670	5.5		0.10
OB-11	J1V2M6	1/6/15	42.0	X	0.39	8000		1000	3700	J	710	6.6		0.10
OB-12	J1V2M7	1/6/15	47.3	X	0.42	11000		990	5000		670	5.4		0.10
DZ-5	J1V2K7	1/7/15	42.8	JX	0.36	1000	U	1000	690	U	690	5.2		0.10
Duplicate of J1V2K7	J1V2L5	1/7/15	45.4	JX	0.37	970	U	970	660	U	660	5.1		0.10
DZ-1	J1V2K3	1/7/15	45.1	JNX	0.36	1000	U	1000	710	U	710	5.2		0.10
DZ-2	J1V2K4	1/7/15	44.1	JX	0.37	1000	U	1000	690	U	690	4.3		0.10
DZ-3	J1V2K5	1/7/15	47.5	JX	0.40	1000	U	1000	710	U	710	4.7		0.10
DZ-4	J1V2K6	1/7/15	46.0	JX	0.37	1000	U	1000	690	U	690	4.9		0.10
DZ-6	J1V2K8	1/7/15	46.4	JX	0.41	1000	U	1000	690	U	690	4.7		0.10
DZ-7	J1V2K9	1/7/15	44.6	JX	0.38	990	U	990	670	U	670	5.8		0.10
DZ-8	J1V2L0	1/7/15	42.4	JX	0.36	980	U	980	660	U	660	5.1		0.10
DZ-9	J1V2L1	1/7/15	43.6	JX	0.37	1000	U	1000	710	U	710	5.1		0.10
DZ-10	J1V2L2	1/7/15	41.9	JX	0.38	1000	U	1000	700	U	700	4.9		0.10
DZ-11	J1V2L3	1/7/15	43.2	JX	0.38	22000		1100	11000		720	6.5		0.10
DZ-12	J1V2L4	1/7/15	37.4	JX	0.42	12000		1100	4700		730	8.0		0.10
Equipment Blank	J1V2M9	1/6/15	0.96	X	0.36							0.13		0.10
Equipment Blank	J1V2K2	1/7/15	1.8	X	0.35							0.10	U	0.10

Attachment	1	Sheet No.	9 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SZ-4 - J1V2J2			Duplicate of J1V2J2 - J1V2K1			SZ-1 - J1V2H9			SZ-2 - J1V2J0			SZ-3 - J1V2J1		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	9.7	U	9.7	11	U	11	10	U	10	11	U	11
Acenaphthylene	PAH	9.4	U	9.4	8.8	U	8.8	9.6	U	9.6	9.4	U	9.4	9.8	U	9.8
Anthracene	PAH	3.2	U	3.2	3.0	U	3.0	3.3	U	3.3	3.2	U	3.2	3.3	U	3.3
Benzo(a)anthracene	PAH	3.3	U	3.3	3.1	U	3.1	6.8	JX	3.4	3.3	U	3.3	3.5	U	3.5
Benzo(a)pyrene	PAH	6.7	U	6.7	6.2	U	6.2	9.6	JX	6.8	6.7	U	6.7	12	JX	6.9
Benzo(b)fluoranthene	PAH	4.4	U	4.4	5.9	J	4.1	15	J	4.5	4.4	U	4.4	4.6	U	4.6
Benzo(ghi)perylene	PAH	7.6	U	7.6	7.0	U	7.0	7.7	U	7.7	7.5	U	7.5	7.8	U	7.8
Benzo(k)fluoranthene	PAH	4.1	U	4.1	3.8	U	3.8	4.7	JX	4.2	4.1	U	4.1	4.3	U	4.3
Chrysene	PAH	5.1	U	5.1	4.7	U	4.7	5.2	U	5.2	5.1	U	5.1	5.2	U	5.2
Dibenz[a,h]anthracene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	12	U	12
Fluoranthene	PAH	14	U	14	13	U	13	14	U	14	14	U	14	14	U	14
Fluorene	PAH	5.5	U	5.5	5.1	U	5.1	5.6	U	5.6	5.5	U	5.5	5.7	U	5.7
Indeno(1,2,3-cd)pyrene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Naphthalene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Phenanthrene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Pyrene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Aroclor-1016	PCB	2.9	U	2.9	2.8	U	2.8	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0
Aroclor-1221	PCB	8.3	U	8.3	8.2	U	8.2	8.7	U	8.7	8.7	U	8.7	8.6	U	8.6
Aroclor-1232	PCB	2.1	U	2.1	2.0	U	2.0	2.2	U	2.2	2.2	U	2.2	2.2	U	2.2
Aroclor-1242	PCB	4.8	U	4.8	4.8	U	4.8	5.0	U	5.0	5.1	U	5.1	5.0	U	5.0
Aroclor-1248	PCB	4.8	U	4.8	4.8	U	4.8	5.0	U	5.0	5.1	U	5.1	5.0	U	5.0
Aroclor-1254	PCB	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8	3.6	J	2.8	8.5	J	2.8
Aroclor-1260	PCB	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8

CONSTITUENT	CLASS	SZ-5 - J1V2J3			SZ-6 - J1V2J4			SZ-7 - J1V2J5			SZ-8 - J1V2J6			SZ-9 - J1V2J7		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	11	U	11	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	9.2	U	9.2	9.6	U	9.6	9.3	U	9.3	9.1	U	9.1	8.7	U	8.7
Anthracene	PAH	3.1	U	3.1	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0
Benzo(a)anthracene	PAH	3.2	U	3.2	3.4	U	3.4	3.3	U	3.3	3.4	JX	3.2	14	J	3.1
Benzo(a)pyrene	PAH	6.5	U	6.5	6.8	U	6.8	9.0	JX	6.6	6.5	U	6.5	17	X	6.2
Benzo(b)fluoranthene	PAH	4.3	U	4.3	4.5	U	4.5	11	J	4.3	4.2	U	4.2	14	JX	4.1
Benzo(ghi)perylene	PAH	7.3	U	7.3	7.6	U	7.6	7.4	U	7.4	7.3	U	7.3	7.0	U	7.0
Benzo(k)fluoranthene	PAH	4.0	U	4.0	4.2	U	4.2	4.2	J	4.1	4.0	U	4.0	6.3	JX	3.8
Chrysene	PAH	4.9	U	4.9	5.1	U	5.1	13	J	5.0	4.9	U	4.9	21	J	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	12	U	12	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	14	U	14	17	J	13	13	U	13	39	X	13
Fluorene	PAH	5.4	U	5.4	5.6	U	5.6	5.4	U	5.4	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	13	U	13	12	U	12	12	U	12	12	JX	12
Naphthalene	PAH	12	U	12	13	U	13	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	13	U	13	12	U	12	12	U	12	21	J	12
Pyrene	PAH	12	U	12	13	U	13	25	J	12	12	U	12	59		12
Aroclor-1016	PCB	2.7	U	2.7	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9
Aroclor-1221	PCB	7.8	U	7.8	8.5	U	8.5	8.3	U	8.3	8.3	U	8.3	8.5	U	8.5
Aroclor-1232	PCB	1.9	U	1.9	2.1	U	2.1	2.1	U	2.1	2.1	U	2.1	2.1	U	2.1
Aroclor-1242	PCB	4.5	U	4.5	5.0	U	5.0	4.8	U	4.8	4.9	U	4.9	4.9	U	4.9
Aroclor-1248	PCB	4.5	U	4.5	5.0	U	5.0	4.8	U	4.8	4.9	U	4.9	4.9	U	4.9
Aroclor-1254	PCB	2.5	U	2.5	2.8	U	2.8	2.7	U	2.7	9.1	J	2.7	84		2.8
Aroclor-1260	PCB	2.5	U	2.5	2.8	U	2.8	13		2.7	2.7	U	2.7	2.8	U	2.8

Attachment	1	Sheet No.	10 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SZ-10 - J1V2J8			SZ-11 - J1V2J9			SZ-12 - J1V2K0			OB-1 - J1V2L6			Duplicate of J1V2L6 - J1V2M8		
		1/7/15			1/7/15			1/7/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	14	J	9.8	10	U	10	11	U	11	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	8.8	U	8.8	9.1	U	9.1	9.5	U	9.5	9.1	U	9.1	8.7	U	8.7
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.2	U	3.2	3.1	U	3.1	2.9	U	2.9
Benzo(a)anthracene	PAH	42		3.1	3.2	U	3.2	3.4	U	3.4	6.6	JX	3.2	8.7	JX	3.1
Benzo(a)pyrene	PAH	32		6.3	6.5	U	6.5	6.8	U	6.8	11	JX	6.5	20		6.2
Benzo(b)fluoranthene	PAH	24	X	4.1	4.2	U	4.2	4.4	U	4.4	9.2	J	4.2	12	JX	4.1
Benzo(ghi)perylene	PAH	14	JX	7.1	7.3	U	7.3	7.6	U	7.6	7.3	U	7.3	6.9	U	6.9
Benzo(k)fluoranthene	PAH	11	J	3.9	4.0	U	4.0	4.2	U	4.2	4.2	J	4.0	6.3	J	3.8
Chrysene	PAH	46		4.8	4.9	U	4.9	5.1	U	5.1	12	J	4.9	20	J	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	12	U	12	11	UN	11	11	UN	11
Fluoranthene	PAH	93		13	13	U	13	14	U	14	22	J	13	33	JX	13
Fluorene	PAH	14	J	5.2	5.3	U	5.3	5.6	U	5.6	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	16	JX	12	12	U	12	13	U	13	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	13	U	13	12	U	12	12	U	12
Phenanthrene	PAH	76		12	12	U	12	13	U	13	15	J	12	23	J	12
Pyrene	PAH	110		12	12	U	12	13	U	13	28	J	12	45		12
Aroclor-1016	PCB	2.8	U	2.8	3.0	U	3.0	2.9	U	2.9	2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB	8.1	U	8.1	8.6	U	8.6	8.5	U	8.5	8.2	U	8.2	8.2	U	8.2
Aroclor-1232	PCB	2.0	U	2.0	2.1	U	2.1	2.1	U	2.1	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	5.0	U	5.0	4.9	U	4.9	4.8	U	4.8	4.8	U	4.8
Aroclor-1248	PCB	4.7	U	4.7	5.0	U	5.0	4.9	U	4.9	4.8	U	4.8	4.8	U	4.8
Aroclor-1254	PCB	60		2.6	2.8	U	2.8	2.8	U	2.8	8.0	J	2.7	9.3	J	2.7
Aroclor-1260	PCB	2.6	U	2.6	2.8	U	2.8	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7

CONSTITUENT	CLASS	OB-2 - J1V2L7			OB-3 - J1V2L8			OB-4 - J1V2L9			OB-5 - J1V2M0			OB-6 - J1V2M1		
		1/6/15			1/6/15			1/6/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	UN	10	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	PAH	9.0	U	9.0	9.0	U	9.0	9.2	U	9.2	9.4	U	9.4	9.4	U	9.4
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.2	U	3.2	3.2	U	3.2
Benzo(a)anthracene	PAH	26	NX	3.2	9.7	J	3.2	3.3	U	3.3	3.3	U	3.3	3.3	U	3.3
Benzo(a)pyrene	PAH	16		6.4	12	J	6.4	6.5	U	6.5	6.7	U	6.7	6.7	U	6.7
Benzo(b)fluoranthene	PAH	16	N	4.2	8.5	J	4.2	4.3	U	4.3	4.9	J	4.4	4.4	U	4.4
Benzo(ghi)perylene	PAH	7.2	U	7.2	7.2	U	7.2	7.3	U	7.3	7.5	U	7.5	7.5	U	7.5
Benzo(k)fluoranthene	PAH	6.0	JN	3.9	4.0	U	4.0	4.0	U	4.0	4.1	U	4.1	4.1	U	4.1
Chrysene	PAH	18	J	4.8	13	J	4.9	4.9	U	4.9	6.1	JX	5	5.1	U	5.1
Dibenz[a,h]anthracene	PAH	11	UN	11	11	UN	11	11	UN	11	11	UN	11	12	UN	12
Fluoranthene	PAH	44	N	13	24	J	13	13	U	13	14	U	14	14	U	14
Fluorene	PAH	5.3	U	5.3	5.3	U	5.3	5.4	U	5.4	5.5	U	5.5	5.5	U	5.5
Indeno(1,2,3-cd)pyrene	PAH	12	UN	12	12	U	12	12	U	12	12	U	12	13	U	13
Naphthalene	PAH	12	UN	12	12	U	12	12	U	12	12	U	12	13	U	13
Phenanthrene	PAH	18	JN	12	12	U	12	12	U	12	12	U	12	13	U	13
Pyrene	PAH	42		12	30	J	12	12	U	12	12	U	12	13	U	13
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8	2.9	U	2.9
Aroclor-1221	PCB	8.1	U	8.1	8.1	U	8.1	8.0	U	8.0	8.2	U	8.2	8.3	U	8.3
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.1	U	2.1
Aroclor-1242	PCB	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8	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	4.8	U	4.8
Aroclor-1254	PCB	29		2.6	29		2.6	2.6	U	2.6	7.9	J	2.7	2.7	U	2.7
Aroclor-1260	PCB	2.6	U	2.6	2.6	UN	2.6	5.0	J	2.6	2.7	U	2.7	2.7	U	2.7

Attachment	1	Sheet No.	11 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	OB-7 - J1V2M2			OB-8 - J1V2M3			OB-9 - J1V2M4			OB-10 - J1V2M5			OB-11 - J1V2M6		
		1/6/15			1/6/15			1/6/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	45	J	10	9.7	U	9.7	10	U	10	11	U	11
Acenaphthylene	PAH	9.4	U	9.4	9.2	U	9.2	8.7	U	8.7	9.4	U	9.4	9.5	U	9.5
Anthracene	PAH	3.2	U	3.2	3.1	U	3.1	3.0	U	3.0	3.2	U	3.2	3.2	U	3.2
Benzo(a)anthracene	PAH	14	J	3.3	300		3.3	14	JX	3.1	8.3	JX	3.3	6.0	JX	3.4
Benzo(a)pyrene	PAH	17		6.7	310		6.6	30		6.2	20		6.7	12	J	6.7
Benzo(b)fluoranthene	PAH	11	J	4.4	160		4.3	22	X	4.1	18	X	4.4	8.6	JX	4.4
Benzo(ghi)perylene	PAH	7.5	U	7.5	150		7.4	13	JX	7.0	7.5	U	7.5	7.6	U	7.6
Benzo(k)fluoranthene	PAH	5.3	J	4.1	81		4.0	11	JX	3.8	8	J	4.1	4.1	U	4.1
Chrysene	PAH	16	J	5.1	320		5.0	30	J	4.7	21	J	5.1	17	J	5.1
Dibenz[a,h]anthracene	PAH	12	UN	12	41	XN	11	11	UN	11	12	UN	12	12	UN	12
Fluoranthene	PAH	35	J	14	520		13	65		13	25	J	14	27	JX	14
Fluorene	PAH	5.5	U	5.5	44		5.4	5.1	U	5.1	5.5	U	5.5	5.6	U	5.6
Indeno(1,2,3-cd)pyrene	PAH	13	U	13	160		12	12	U	12	13	U	13	13	U	13
Naphthalene	PAH	13	U	13	12	U	12	12	U	12	13	U	13	13	U	13
Phenanthrene	PAH	21	J	13	240		12	44		12	13	U	13	16	J	13
Pyrene	PAH	42		13	690		12	80		12	34	J	13	36	J	13
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9
Aroclor-1221	PCB	8.0	U	8.0	8.1	U	8.1	8.4	U	8.4	8.3	U	8.3	8.3	U	8.3
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.1	U	2.1	2.1	U	2.1	2.1	U	2.1
Aroclor-1242	PCB	4.6	U	4.6	4.7	U	4.7	4.9	U	4.9	4.8	U	4.8	4.8	U	4.8
Aroclor-1248	PCB	4.6	U	4.6	4.7	U	4.7	4.9	U	4.9	4.8	U	4.8	4.8	U	4.8
Aroclor-1254	PCB	27		2.6	64		2.6	2.7	U	2.7	2.7	U	2.7	19		2.7
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	65		2.7	12		2.7	2.7	U	2.7

CONSTITUENT	CLASS	OB-12 - J1V2M7			DZ-5 - J1V2K7			Duplicate of J1V2K7 - J1V2L5			DZ-1 - J1V2K3			DZ-2 - J1V2K4		
		1/6/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	10	U	10	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	9.2	U	9.2	9.3	U	9.3	9.0	U	9.0	9.0	U	9.0	8.7	U	8.7
Anthracene	PAH	3.1	U	3.1	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0	3.0	U	3.0
Benzo(a)anthracene	PAH	7.5	J	3.3	3.3	U	3.3	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	8.0	JX	6.6	6.6	U	6.6	6.4	U	6.4	6.4	U	6.4	6.2	U	6.2
Benzo(b)fluoranthene	PAH	6.4	JX	4.3	4.3	U	4.3	4.2	UN	4.2	4.2	U	4.2	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.4	U	7.4	7.4	U	7.4	7.2	U	7.2	7.2	U	7.2	7.0	U	7.0
Benzo(k)fluoranthene	PAH	4.0	U	4.0	4.0	UN	4.0	4.0	UN	4.0	3.9	UN	3.9	3.8	UN	3.8
Chrysene	PAH	9.6	JX	5.0	5.0	U	5.0	4.9	U	4.9	4.8	U	4.8	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	UN	11	11	U	11	11	UN	11	11	U	11	11	U	11
Fluoranthene	PAH	18	J	13	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.4	U	5.4	5.4	U	5.4	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	21	J	12	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	U	2.8	2.9	U	2.9	2.8	U	2.8	2.9	U	2.9	2.8	U	2.8
Aroclor-1221	PCB	8.0	U	8.0	8.3	U	8.3	8.2	U	8.2	8.3	U	8.3	8.2	U	8.2
Aroclor-1232	PCB	2.0	U	2.0	2.1	U	2.1	2.0	U	2.0	2.1	U	2.1	2.1	U	2.1
Aroclor-1242	PCB	4.7	U	4.7	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Aroclor-1248	PCB	4.7	U	4.7	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Aroclor-1254	PCB	2.6	U	2.6	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7
Aroclor-1260	PCB	19		2.6	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7

Attachment	1	Sheet No.	12 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	DZ-3 - J1V2K5			DZ-4 - J1V2K6			DZ-6 - J1V2K8			DZ-7 - J1V2K9			DZ-8 - J1V2L0		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.7	U	9.7	10	U	10	10	U	10	9.8	U	9.8	9.9	U	9.9
Acenaphthylene	PAH	8.8	U	8.8	9.2	U	9.2	9.1	U	9.1	8.8	U	8.8	8.9	U	8.9
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	3.3	U	3.3	3.2	U	3.2	3.1	U	3.1	3.2	U	3.2
Benzo(a)pyrene	PAH	6.2	U	6.2	6.6	U	6.6	6.5	U	6.5	6.3	U	6.3	6.4	U	6.4
Benzo(b)fluoranthene	PAH	4.1	U	4.1	4.3	U	4.3	4.3	U	4.3	4.1	U	4.1	4.2	U	4.2
Benzo(ghi)perylene	PAH	7.0	U	7.0	7.4	U	7.4	7.3	U	7.3	7.1	U	7.1	7.1	U	7.1
Benzo(k)fluoranthene	PAH	3.8	UN	3.8	4.0	UN	4.0	4.0	UN	4.0	3.9	UN	3.9	3.9	UN	3.9
Chrysene	PAH	4.7	U	4.7	5.0	U	5.0	4.9	U	4.9	4.8	U	4.8	4.8	U	4.8
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.1	U	5.1	5.4	U	5.4	5.4	U	5.4	5.2	U	5.2	5.2	U	5.2
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	U	2.8	2.9	U	2.9	2.7	U	2.7	2.9	U	2.9	2.9	U	2.9
Aroclor-1221	PCB	8.2	U	8.2	8.3	U	8.3	7.9	U	7.9	8.3	U	8.3	8.3	U	8.3
Aroclor-1232	PCB	2.0	U	2.0	2.1	U	2.1	2.0	U	2.0	2.1	U	2.1	2.1	U	2.1
Aroclor-1242	PCB	4.8	U	4.8	4.8	U	4.8	4.6	U	4.6	4.8	U	4.8	4.8	U	4.8
Aroclor-1248	PCB	4.8	U	4.8	4.8	U	4.8	4.6	U	4.6	4.8	U	4.8	4.8	U	4.8
Aroclor-1254	PCB	2.9	J	2.7	2.7	U	2.7	2.5	U	2.5	2.7	U	2.7	2.7	U	2.7
Aroclor-1260	PCB	2.7	U	2.7	2.7	U	2.7	2.5	U	2.5	2.7	U	2.7	2.7	U	2.7

CONSTITUENT	CLASS	DZ-9 - J1V2L1			DZ-10 - J1V2L2			DZ-11 - J1V2L3			DZ-12 - J1V2L4			Equipment Blank - J1V2M9		
		1/7/15			1/7/15			1/7/15			1/7/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	9.7	U	9.7	10	U	10	10	U	10	9.9	U	9.9
Acenaphthylene	PAH	9.0	U	9.0	8.7	U	8.7	9.1	U	9.1	9.4	U	9.4	9.0	U	9.0
Anthracene	PAH	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.2	U	3.2	3.0	U	3.0
Benzo(a)anthracene	PAH	3.2	U	3.2	3.1	U	3.1	24	X	3.2	3.3	U	3.3	3.2	U	3.2
Benzo(a)pyrene	PAH	6.4	U	6.4	6.2	U	6.2	40		6.5	7.7	JX	6.7	6.4	U	6.4
Benzo(b)fluoranthene	PAH	4.2	U	4.2	4.1	U	4.1	24	X	4.3	5.3	J	4.4	4.2	U	4.2
Benzo(ghi)perylene	PAH	7.2	U	7.2	7.0	U	7.0	30		7.3	7.5	U	7.5	7.2	U	7.2
Benzo(k)fluoranthene	PAH	3.9	UN	3.9	3.8	UN	3.8	8.6	JXN	4.0	4.1	UN	4.1	3.9	U	3.9
Chrysene	PAH	4.8	U	4.8	4.7	U	4.7	28	JX	4.9	7.1	J	5.1	4.8	U	4.8
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	12	U	12	11	UN	11
Fluoranthene	PAH	13	U	13	13	U	13	60	X	13	17	J	14	13	U	13
Fluorene	PAH	5.3	U	5.3	5.1	U	5.1	5.4	U	5.4	5.5	U	5.5	5.3	U	5.3
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	19	JX	12	13	U	13	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	13	U	13	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	37	J	12	13	U	13	12	U	12
Pyrene	PAH	12	U	12	12	U	12	74		12	16	J	13	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.8	U	2.8	2.8	U	2.8	3.0	U	3.0			
Aroclor-1221	PCB	7.9	U	7.9	8.1	U	8.1	8.2	U	8.2	8.6	U	8.6			
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.1	U	2.1	2.1	U	2.1			
Aroclor-1242	PCB	4.6	U	4.6	4.7	U	4.7	4.8	U	4.8	5.0	U	5.0			
Aroclor-1248	PCB	4.6	U	4.6	4.7	U	4.7	4.8	U	4.8	5.0	U	5.0			
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	42		2.7	14		2.8			
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7	2.8	U	2.8			

Attachment	1	Sheet No.	13 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	Equipment Blank - J1V2K2 1/7/15		
		ug/kg	Q	PQL
Acenaphthene	PAH	9.2	UN	9.2
Acenaphthylene	PAH	8.3	U	8.3
Anthracene	PAH	2.8	U	2.8
Benzo(a)anthracene	PAH	2.9	U	2.9
Benzo(a)pyrene	PAH	5.9	U	5.9
Benzo(b)fluoranthene	PAH	3.9	U	3.9
Benzo(ghi)perylene	PAH	6.6	U	6.6
Benzo(k)fluoranthene	PAH	3.6	U	3.6
Chrysene	PAH	4.5	U	4.5
Dibenz[a,h]anthracene	PAH	10	U	10
Fluoranthene	PAH	12	UN	12
Fluorene	PAH	4.9	UN	4.9
Indeno(1,2,3-cd)pyrene	PAH	11	U	11
Naphthalene	PAH	11	U	11
Phenanthrene	PAH	11	UN	11
Pyrene	PAH	11	U	11
Aroclor-1016	PCB			
Aroclor-1221	PCB			
Aroclor-1232	PCB			
Aroclor-1242	PCB			
Aroclor-1248	PCB			
Aroclor-1254	PCB			
Aroclor-1260	PCB			

Attachment	1	Sheet No.	14 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
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		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SZ-4 - J1V2J2			Duplicate of J1V2J2 - J1V2K1			SZ-1 - J1V2H9			SZ-2 - J1V2J0			SZ-3 - J1V2J1		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	29	U	29	28	U	28	30	U	30	30	UX	30	30	U	30
1,2-Dichlorobenzene	SVOA	23	U	23	22	U	22	24	U	24	24	UX	24	24	U	24
1,3-Dichlorobenzene	SVOA	13	U	13	12	U	12	13	U	13	13	UX	13	13	U	13
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	15	U	15	15	UX	15	15	U	15
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	11	U	11	11	U	11	11	U	11
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	11	U	11	11	U	11	11	U	11
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	11	U	11	11	UX	11	11	U	11
2,4-Dimethylphenol	SVOA	69	U	69	67	U	67	71	U	71	71	UX	71	71	U	71
2,4-Dinitrophenol	SVOA	350	U	350	340	U	340	360	U	360	360	U	360	360	U	360
2,4-Dinitrotoluene	SVOA	69	U	69	67	U	67	71	U	71	71	U	71	71	U	71
2,6-Dinitrotoluene	SVOA	29	U	29	28	U	28	30	U	30	30	U	30	30	U	30
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	11	U	11	11	UX	11	11	U	11
2-Chlorophenol	SVOA	22	U	22	21	U	21	23	U	23	23	UX	23	22	U	22
2-Methylnaphthalene	SVOA	20	U	20	19	U	19	20	U	20	20	UX	20	20	U	20
2-Methylphenol (cresol, o-)	SVOA	14	U	14	13	U	13	14	U	14	14	UX	14	14	U	14
2-Nitroaniline	SVOA	52	U	52	51	U	51	54	U	54	54	U	54	53	U	53
2-Nitrophenol	SVOA	10	U	10	10	U	10	11	U	11	11	UX	11	11	U	11
3,3'-Dichlorobenzidine	SVOA	94	U	94	91	U	91	97	U	97	97	U	97	96	U	96
3+4 Methylphenol (cresol, m+p)	SVOA	34	U	34	33	U	33	35	U	35	35	UX	35	35	U	35
3-Nitroaniline	SVOA	76	U	76	74	U	74	78	U	78	78	U	78	78	U	78
4,6-Dinitro-2-methylphenol	SVOA	340	U	340	330	U	330	350	U	350	350	U	350	350	U	350
4-Bromophenylphenyl ether	SVOA	20	U	20	19	U	19	20	U	20	20	U	20	20	U	20
4-Chloro-3-methylphenol	SVOA	69	U	69	67	U	67	71	U	71	71	U	71	71	U	71
4-Chloroaniline	SVOA	86	U	86	83	U	83	88	U	88	88	U	88	88	U	88
4-Chlorophenylphenyl ether	SVOA	22	U	22	21	U	21	23	U	23	23	U	23	22	U	22
4-Nitroaniline	SVOA	76	U	76	74	U	74	78	U	78	78	U	78	78	U	78
4-Nitrophenol	SVOA	100	U	100	98	U	98	100	U	100	100	U	100	100	U	100
Acenaphthene	SVOA	11	U	11	10	U	10	11	U	11	11	U	11	11	U	11
Acenaphthylene	SVOA	18	U	18	17	U	17	18	U	18	18	UX	18	18	U	18
Anthracene	SVOA	18	U	18	17	U	17	18	U	18	18	U	18	18	U	18
Benzo(a)anthracene	SVOA	21	U	21	20	U	20	22	U	22	21	U	21	21	U	21
Benzo(a)pyrene	SVOA	21	U	21	20	U	20	22	U	22	21	U	21	21	U	21
Benzo(b)fluoranthene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28	28	U	28
Benzo(ghi)perylene	SVOA	17	U	17	16	U	16	17	U	17	17	U	17	17	U	17
Benzo(k)fluoranthene	SVOA	42	U	42	41	U	41	43	U	43	43	U	43	43	U	43
Bis(2-chloro-1-methylethyl)ether	SVOA	24	U	24	23	U	23	25	U	25	25	UX	25	25	U	25
Bis(2-Chloroethoxy)methane	SVOA	24	U	24	23	U	23	25	U	25	25	UX	25	25	U	25
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	18	U	18	18	UX	18	18	U	18
Bis(2-ethylhexyl) phthalate	SVOA	48	U	48	47	U	47	49	U	49	49	U	49	49	U	49
Butylbenzylphthalate	SVOA	45	U	45	44	U	44	46	U	46	46	U	46	46	U	46
Carbazole	SVOA	38	U	38	37	U	37	39	U	39	39	U	39	38	U	38
Chrysene	SVOA	28	U	28	27	U	27	29	U	29	29	U	29	29	U	29
Dibenz[a,h]anthracene	SVOA	20	U	20	19	U	19	20	U	20	20	U	20	20	U	20
Dibenzofuran	SVOA	21	U	21	20	U	20	22	U	22	21	U	21	21	U	21
Diethyl phthalate	SVOA	27	U	27	26	U	26	28	U	28	28	U	28	28	U	28
Dimethyl phthalate	SVOA	24	U	24	23	U	23	25	U	25	25	U	25	25	U	25
Di-n-butylphthalate	SVOA	30	U	30	29	U	29	31	U	31	31	U	31	31	U	31
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
Fluoranthene	SVOA	38	U	38	37	U	37	39	U	39	39	U	39	38	U	38
Fluorene	SVOA	19	U	19	18	U	18	19	U	19	19	U	19	19	U	19
Hexachlorobenzene	SVOA	30	U	30	29	U	29	31	U	31	31	U	31	31	U	31
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	11	U	11	11	UX	11	11	U	11
Hexachlorocyclopentadiene	SVOA	52	U	52	51	U	51	54	U	54	54	UX	54	53	U	53
Hexachloroethane	SVOA	22	U	22	22	U	22	23	U	23	23	UX	23	23	U	23
Indeno(1,2,3-cd)pyrene	SVOA	23	U	23	22	U	22	24	U	24	24	U	24	24	U	24
Isophorone	SVOA	18	U	18	17	U	17	18	U	18	18	UX	18	18	U	18
Naphthalene	SVOA	32	U	32	31	U	31	33	U	33	33	UX	33	33	U	33
Nitrobenzene	SVOA	23	U	23	22	U	22	24	U	24	24	UX	24	24	U	24
N-Nitroso-di-n-dipropylamine	SVOA	32	U	32	31	U	31	33	U	33	33	UX	33	33	U	33
N-Nitrosodiphenylamine	SVOA	22	U	22	21	U	21	23	U	23	23	U	23	22	U	22
Pentachlorophenol	SVOA	340	U	340	330	U	330	350	U	350	350	U	350	350	U	350
Phenanthrene	SVOA	18	U	18	17	U	17	18	U	18	18	U	18	18	U	18
Phenol	SVOA	19	U	19	18	U	18	19	U	19	19	UX	19	19	U	19
Pyrene	SVOA	13	U	13	12	U	12	15	J	13	13	U	13	13	U	13

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Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
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Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SZ-5 - J1V2J3			SZ-6 - J1V2J4			SZ-7 - J1V2J5			SZ-8 - J1V2J6			SZ-9 - J1V2J7		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	29	U	29	29	U	29	29	U	29	29	U	29
1,2-Dichlorobenzene	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	23	U	23
1,3-Dichlorobenzene	SVOA	12	U	12	13	U	13	13	U	13	13	U	13	13	U	13
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	67	U	67	69	U	69	69	U	69	69	U	69	69	U	69
2,4-Dinitrophenol	SVOA	340	U	340	350	U	350	350	U	350	350	U	350	350	U	350
2,4-Dinitrotoluene	SVOA	67	U	67	69	U	69	69	U	69	69	U	69	69	U	69
2,6-Dinitrotoluene	SVOA	28	U	28	29	U	29	29	U	29	29	U	29	29	U	29
2-Chloronaphthalene	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	22	U	22	22	U	22	22	U	22	22	U	22
2-Methylnaphthalene	SVOA	19	U	19	20	U	20	20	U	20	20	U	20	20	U	20
2-Methylphenol (cresol, o-)	SVOA	13	U	13	14	U	14	14	U	14	14	U	14	14	U	14
2-Nitroaniline	SVOA	51	U	51	53	U	53	52	U	52	52	U	52	52	U	52
2-Nitrophenol	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	91	U	91	95	U	95	94	U	94	94	U	94	94	U	94
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	35	U	35	34	U	34	35	U	35	34	U	34
3-Nitroaniline	SVOA	74	U	74	77	U	77	76	U	76	76	U	76	76	U	76
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	350	U	350	340	U	340	350	U	350	340	U	340
4-Bromophenylphenyl ether	SVOA	19	U	19	20	U	20	20	U	20	20	U	20	20	U	20
4-Chloro-3-methylphenol	SVOA	67	U	67	69	U	69	69	U	69	69	U	69	69	U	69
4-Chloroaniline	SVOA	83	U	83	86	U	86	86	U	86	86	U	86	86	U	86
4-Chlorophenylphenyl ether	SVOA	21	U	21	22	U	22	22	U	22	22	U	22	22	U	22
4-Nitroaniline	SVOA	74	U	74	76	U	76	76	U	76	76	U	76	76	U	76
4-Nitrophenol	SVOA	98	U	98	100	U	100	100	U	100	100	U	100	100	U	100
Acenaphthene	SVOA	10	U	10	11	U	11	11	U	11	11	U	11	11	U	11
Acenaphthylene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	18	U	18
Anthracene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	20	J	18
Benzo(a)anthracene	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	57	J	21
Benzo(a)pyrene	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	53	J	21
Benzo(b)fluoranthene	SVOA	27	U	27	28	U	28	27	U	27	27	U	27	53	J	27
Benzo(ghi)perylene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	29	J	17
Benzo(k)fluoranthene	SVOA	41	U	41	42	U	42	42	U	42	42	U	42	42	U	42
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	24	U	24	24	U	24	24	U	24	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	24	U	24	24	U	24	24	U	24	24	U	24
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	47	U	47	48	U	48	48	U	48	48	U	48	48	U	48
Butylbenzylphthalate	SVOA	44	U	44	45	U	45	45	U	45	45	U	45	45	U	45
Carbazole	SVOA	37	U	37	38	U	38	38	U	38	38	U	38	38	U	38
Chrysene	SVOA	27	U	27	28	U	28	28	U	28	28	U	28	68	J	28
Dibenz[a,h]anthracene	SVOA	19	U	19	20	U	20	20	U	20	20	U	20	20	U	20
Dibenzofuran	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	21	U	21
Diethyl phthalate	SVOA	26	U	26	27	U	27	27	U	27	27	U	27	27	U	27
Dimethyl phthalate	SVOA	23	U	23	24	U	24	24	U	24	24	U	24	24	U	24
Di-n-butylphthalate	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	30	U	30
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
Fluoranthene	SVOA	37	U	37	38	U	38	38	U	38	38	U	38	120	J	38
Fluorene	SVOA	18	U	18	19	U	19	19	U	19	19	U	19	19	U	19
Hexachlorobenzene	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	30	U	30
Hexachlorobutadiene	SVOA	10	U	10	11	U	11	10	U	10	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	51	U	51	53	U	53	52	U	52	52	U	52	52	U	52
Hexachloroethane	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	28	J	23
Isophorone	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	18	U	18
Naphthalene	SVOA	31	U	31	33	U	33	32	U	32	32	U	32	32	U	32
Nitrobenzene	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	23	U	23
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	33	U	33	32	U	32	32	U	32	32	U	32
N-Nitrosodiphenylamine	SVOA	21	U	21	22	U	22	22	U	22	22	U	22	22	U	22
Pentachlorophenol	SVOA	330	U	330	350	U	350	340	U	340	350	U	350	340	U	340
Phenanthrene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	92	J	18
Phenol	SVOA	18	U	18	19	U	19	19	U	19	19	U	19	19	U	19
Pyrene	SVOA	12	U	12	13	U	13	29	J	13	13	U	13	130	J	13

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Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	SZ-10 - J1V2J8			SZ-11 - J1V2J9			SZ-12 - J1V2K0			OB-1 - J1V2L6			Duplicate of J1V2L6 - J1V2M8		
		1/7/15			1/7/15			1/7/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	30	U	30	30	U	30	29	U	29	27	UX	27	28	U	28
1,2-Dichlorobenzene	SVOA	23	U	23	23	U	23	23	U	23	22	UX	22	22	U	22
1,3-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	12	UX	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	14	U	14	13	UX	13	14	U	14
2,4,5-Trichlorophenol	SVOA	11	U	11	11	U	11	10	U	10	9.8	U	9.8	10	U	10
2,4,6-Trichlorophenol	SVOA	11	U	11	11	U	11	10	U	10	9.8	U	9.8	10	U	10
2,4-Dichlorophenol	SVOA	11	U	11	11	U	11	10	U	10	9.8	UX	9.8	10	U	10
2,4-Dimethylphenol	SVOA	70	U	70	70	U	70	69	U	69	65	UX	65	67	U	67
2,4-Dinitrophenol	SVOA	350	U	350	350	U	350	350	U	350	330	UX	330	340	U	340
2,4-Dinitrotoluene	SVOA	70	U	70	70	U	70	69	U	69	65	U	65	67	U	67
2,6-Dinitrotoluene	SVOA	30	U	30	30	U	30	29	U	29	27	U	27	28	U	28
2-Chloronaphthalene	SVOA	11	U	11	11	U	11	10	U	10	9.8	UX	9.8	10	U	10
2-Chlorophenol	SVOA	22	U	22	22	U	22	22	U	22	21	UX	21	21	U	21
2-Methylnaphthalene	SVOA	20	U	20	20	U	20	20	U	20	19	UX	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	14	U	14	14	U	14	14	U	14	13	UX	13	13	U	13
2-Nitroaniline	SVOA	53	U	53	53	U	53	52	U	52	49	U	49	50	U	50
2-Nitrophenol	SVOA	11	U	11	11	U	11	10	U	10	9.8	UX	9.8	10	U	10
3,3'-Dichlorobenzidine	SVOA	95	U	95	95	U	95	94	U	94	88	U	88	91	U	91
3+4 Methylphenol (cresol, m+p)	SVOA	35	U	35	35	U	35	35	U	35	32	UX	32	33	U	33
3-Nitroaniline	SVOA	77	U	77	77	U	77	77	U	77	72	U	72	74	U	74
4,6-Dinitro-2-methylphenol	SVOA	350	U	350	350	U	350	350	U	350	320	U	320	330	U	330
4-Bromophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	70	U	70	70	U	70	69	U	69	65	U	65	67	U	67
4-Chloroaniline	SVOA	86	U	86	87	U	87	86	U	86	80	U	80	83	U	83
4-Chlorophenylphenyl ether	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	21	U	21
4-Nitroaniline	SVOA	76	U	76	77	U	77	76	U	76	71	U	71	73	U	73
4-Nitrophenol	SVOA	100	U	100	100	U	100	100	U	100	95	U	95	98	U	98
Acenaphthene	SVOA	11	U	11	11	U	11	11	U	11	10	U	10	10	U	10
Acenaphthylene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	17	U	17
Anthracene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	36	J	21	21	U	21	21	U	21	20	U	20	20	J	20
Benzo(a)pyrene	SVOA	26	J	21	21	U	21	21	U	21	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	28	U	28	28	U	28	27	U	27	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	17	J	17	17	U	17	17	U	17	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	42	U	42	42	U	42	42	U	42	39	U	39	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	24	U	24	24	U	24	24	U	24	23	UX	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	24	U	24	24	U	24	24	U	24	23	UX	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	18	U	18	18	U	18	17	U	17	16	UX	16	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	49	U	49	49	U	49	48	U	48	120	J	45	46	U	46
Butylbenzylphthalate	SVOA	45	U	45	45	U	45	45	U	45	42	UX	42	43	U	43
Carbazole	SVOA	38	U	38	38	U	38	38	U	38	35	U	35	36	U	36
Chrysene	SVOA	42	J	28	29	U	29	28	U	28	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	20	U	20	20	U	20	20	U	20	19	U	19	19	U	19
Dibenzofuran	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	20	U	20
Diethyl phthalate	SVOA	27	U	27	28	U	28	27	U	27	26	U	26	26	U	26
Dimethyl phthalate	SVOA	24	U	24	24	U	24	24	U	24	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	31	U	31	31	U	31	30	U	30	28	U	28	29	U	29
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	15	U	15	14	U	14	15	U	15
Fluoranthene	SVOA	62	J	38	38	U	38	38	U	38	35	U	35	36	U	36
Fluorene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	18	U	18
Hexachlorobenzene	SVOA	31	U	31	31	U	31	30	U	30	28	U	28	29	U	29
Hexachlorobutadiene	SVOA	11	U	11	11	U	11	10	U	10	9.8	UX	9.8	10	U	10
Hexachlorocyclopentadiene	SVOA	53	U	53	53	U	53	52	U	52	49	UX	49	50	U	50
Hexachloroethane	SVOA	22	U	22	23	U	23	22	U	22	21	UX	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	23	U	23	23	U	23	23	U	23	22	U	22	22	U	22
Isophorone	SVOA	18	U	18	18	U	18	18	U	18	17	UX	17	17	U	17
Naphthalene	SVOA	33	U	33	33	U	33	32	U	32	30	UX	30	31	U	31
Nitrobenzene	SVOA	23	U	23	23	U	23	23	U	23	22	UX	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	33	U	33	33	U	33	32	U	32	30	UX	30	31	U	31
N-Nitrosodiphenylamine	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	21	U	21
Pentachlorophenol	SVOA	350	U	350	350	U	350	350	U	350	320	UX	320	330	U	330
Phenanthrene	SVOA	33	J	18	18	U	18	18	U	18	19	J	17	17	U	17
Phenol	SVOA	19	U	19	19	U	19	19	U	19	18	UX	18	18	U	18
Pyrene	SVOA	67	J	13	13	U	13	13	U	13	29	J	12	31	J	12

Attachment	1	Sheet No.	17 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	OB-2 - J1V2L7			OB-3 - J1V2L8			OB-4 - J1V2L9			OB-5 - J1V2M0			OB-6 - J1V2M1		
		1/6/15			1/6/15			1/6/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28	28	U	28	27	U	27	30	U	30
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	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	13	U	13
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	14	U	14	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
2,4-Dimethylphenol	SVOA	66	U	66	66	U	66	66	U	66	64	U	64	70	U	70
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320	350	U	350
2,4-Dinitrotoluene	SVOA	66	U	66	66	U	66	66	U	66	64	U	64	70	U	70
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28	28	U	28	27	U	27	30	U	30
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	22	U	22
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	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	14	U	14
2-Nitroaniline	SVOA	50	U	50	50	U	50	50	U	50	48	U	48	53	U	53
2-Nitrophenol	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
3,3'-Dichlorobenzidine	SVOA	90	U	90	90	U	90	90	U	90	87	U	87	96	U	96
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	33	U	33	33	U	33	32	U	32	35	U	35
3-Nitroaniline	SVOA	73	U	73	73	U	73	73	U	73	71	U	71	78	U	78
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320	350	U	350
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	20	U	20
4-Chloro-3-methylphenol	SVOA	66	U	66	66	U	66	66	U	66	64	U	64	70	U	70
4-Chloroaniline	SVOA	82	U	82	82	U	82	82	U	82	79	U	79	87	U	87
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	22	U	22
4-Nitroaniline	SVOA	73	U	73	72	U	72	73	U	73	70	U	70	77	U	77
4-Nitrophenol	SVOA	97	U	97	97	U	97	97	U	97	94	U	94	100	U	100
Acenaphthene	SVOA	11	J	10	10	U	10	10	U	10	10	U	10	11	U	11
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	18	U	18
Anthracene	SVOA	17	J	17	17	U	17	17	U	17	16	U	16	18	U	18
Benzo(a)anthracene	SVOA	28	J	20	20	U	20	20	U	20	19	U	19	21	U	21
Benzo(a)pyrene	SVOA	24	J	20	20	U	20	20	U	20	19	U	19	21	U	21
Benzo(b)fluoranthene	SVOA	27	J	26	26	U	26	26	U	26	25	U	25	28	U	28
Benzo(ghi)perylene	SVOA	20	J	16	16	U	16	16	U	16	15	U	15	17	U	17
Benzo(k)fluoranthene	SVOA	40	U	40	40	U	40	40	U	40	39	U	39	43	U	43
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	23	U	23	22	U	22	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	23	U	23	22	U	22	24	U	24
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	18	U	18
Bis(2-ethylhexyl) phthalate	SVOA	140	J	46	46	U	46	46	U	46	45	U	45	49	U	49
Butylbenzylphthalate	SVOA	43	U	43	43	U	43	43	U	43	42	U	42	46	U	46
Carbazole	SVOA	36	U	36	36	U	36	36	U	36	35	U	35	38	U	38
Chrysene	SVOA	28	J	27	27	U	27	27	U	27	26	U	26	29	U	29
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	20	U	20
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	19	U	19	21	U	21
Diethyl phthalate	SVOA	26	U	26	26	U	26	26	U	26	25	U	25	28	U	28
Dimethyl phthalate	SVOA	23	U	23	23	U	23	23	U	23	22	U	22	24	U	24
Di-n-butylphthalate	SVOA	29	U	29	38	J	29	29	U	29	28	U	28	31	U	31
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	15	U	15
Fluoranthene	SVOA	36	U	36	36	U	36	36	U	36	35	U	35	38	U	38
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	19	U	19
Hexachlorobenzene	SVOA	29	U	29	29	U	29	29	U	29	28	U	28	31	U	31
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	10	U	10	9.7	U	9.7	11	U	11
Hexachlorocyclopentadiene	SVOA	50	U	50	50	U	50	50	U	50	48	U	48	53	U	53
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	23	U	23
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	23	U	23
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	18	U	18
Naphthalene	SVOA	31	U	31	31	U	31	31	U	31	30	U	30	33	U	33
Nitrobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	23	U	23
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	31	U	31	31	U	31	30	U	30	33	U	33
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	22	U	22
Pentachlorophenol	SVOA	330	U	330	330	U	330	330	U	330	320	U	320	350	U	350
Phenanthrene	SVOA	25	J	17	17	U	17	17	U	17	16	U	16	18	U	18
Phenol	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	19	U	19
Pyrene	SVOA	36	J	12	21	J	12	12	U	12	22	J	12	13	U	13

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Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	OB-7 - J1V2M2			OB-8 - J1V2M3			OB-9 - J1V2M4			OB-10 - J1V2M5			OB-11 - J1V2M6		
		1/6/15			1/6/15			1/6/15			1/6/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	29	U	29	28	U	28	29	U	29
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	23	U	23	22	U	22	23	U	23
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	14	U	14	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	65	U	65	65	U	65	68	U	68	67	U	67	68	U	68
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	340	U	340	340	U	340	340	U	340
2,4-Dinitrotoluene	SVOA	65	U	65	65	U	65	68	U	68	67	U	67	68	U	68
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	29	U	29	28	U	28	29	U	29
2-Chloronaphthalene	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	21	U	21	22	U	22	21	U	21	22	U	22
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	20	U	20
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	49	U	49	51	U	51	51	U	51	52	U	52
2-Nitrophenol	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	89	U	89	88	U	88	92	U	92	92	U	92	93	U	93
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	34	U	34	34	U	34	34	U	34
3-Nitroaniline	SVOA	72	U	72	71	U	71	75	U	75	74	U	74	76	U	76
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	320	U	320	340	U	340	340	U	340	340	U	340
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	20	U	20
4-Chloro-3-methylphenol	SVOA	65	U	65	65	U	65	68	U	68	67	U	67	68	U	68
4-Chloroaniline	SVOA	81	U	81	80	U	80	84	U	84	83	U	83	85	U	85
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	22	U	22	21	U	21	22	U	22
4-Nitroaniline	SVOA	72	U	72	71	U	71	74	U	74	74	U	74	75	U	75
4-Nitrophenol	SVOA	96	U	96	95	U	95	99	U	99	99	U	99	100	U	100
Acenaphthene	SVOA	10	U	10	92	J	10	11	U	11	10	U	10	11	U	11
Acenaphthylene	SVOA	17	U	17	18	J	17	17	U	17	17	U	17	18	U	18
Anthracene	SVOA	17	U	17	340		17	17	U	17	17	U	17	18	U	18
Benzo(a)anthracene	SVOA	20	U	20	600		20	33	J	20	26	J	20	21	U	21
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	28	J	20	20	U	20	21	U	21
Benzo(b)fluoranthene	SVOA	26	U	26	820	K	26	27	U	27	27	U	27	27	U	27
Benzo(ghi)perylene	SVOA	17	J	16	220	J	16	16	U	16	16	U	16	17	U	17
Benzo(k)fluoranthene	SVOA	40	U	40	39	UK	39	41	U	41	41	U	41	41	U	41
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	24	U	24	23	U	23	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	24	U	24	23	U	23	24	U	24
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	45	U	45	47	U	47	47	U	47	48	U	48
Butylbenzylphthalate	SVOA	43	U	43	42	U	42	44	U	44	44	U	44	45	U	45
Carbazole	SVOA	36	U	36	87	J	35	37	U	37	37	U	37	37	U	37
Chrysene	SVOA	27	U	27	650		26	32	J	28	27	U	27	28	U	28
Dibenz[a,h]anthracene	SVOA	19	U	19	65	J	19	19	U	19	19	U	19	20	U	20
Dibenzofuran	SVOA	20	U	20	61	J	20	20	U	20	20	U	20	21	U	21
Diethyl phthalate	SVOA	26	U	26	25	U	25	27	U	27	26	U	26	27	U	27
Dimethyl phthalate	SVOA	23	U	23	23	U	23	24	U	24	23	U	23	24	U	24
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	30	U	30	29	U	29	30	U	30
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	15	U	15	15	U	15	15	U	15
Fluoranthene	SVOA	36	U	36	1400		35	58	J	37	37	U	37	37	U	37
Fluorene	SVOA	18	U	18	150	J	18	18	U	18	18	U	18	19	U	19
Hexachlorobenzene	SVOA	29	U	29	28	U	28	30	U	30	29	U	29	30	U	30
Hexachlorobutadiene	SVOA	9.9	U	9.9	9.8	U	9.8	10	U	10	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	50	U	50	49	U	49	51	U	51	51	U	51	52	U	52
Hexachloroethane	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	22	U	22
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	240	J	22	23	U	23	22	U	22	23	U	23
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	18	U	18
Naphthalene	SVOA	31	U	31	30	U	30	32	U	32	32	U	32	32	U	32
Nitrobenzene	SVOA	22	U	22	22	U	22	23	U	23	22	U	22	23	U	23
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	32	U	32	32	U	32	32	U	32
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	22	U	22	21	U	21	22	U	22
Pentachlorophenol	SVOA	330	U	330	320	U	320	340	U	340	340	U	340	340	U	340
Phenanthrene	SVOA	17	U	17	1200		17	33	J	17	24	J	17	18	U	18
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	19	U	19
Pyrene	SVOA	24	J	12	1300		12	62	J	12	39	J	12	25	J	13

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Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	OB-12 - J1V2M7			DZ-5 - J1V2K7			Duplicate of J1V2K7 - J1V2L5			DZ-1 - J1V2K3			DZ-2 - J1V2K4		
		1/6/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	29	U	29	29	U	29	28	U	28	29	U	29	29	U	29
1,2-Dichlorobenzene	SVOA	22	U	22	23	UJ	23	22	UJ	22	22	UJ	22	22	UJX	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	UJ	12	12	UJ	12	12	UJ	12	12	UJX	12
1,4-Dichlorobenzene	SVOA	14	U	14	14	UJ	14	14	UJ	14	14	UJ	14	14	UJX	14
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	67	U	67	68	U	68	67	U	67	67	U	67	67	U	67
2,4-Dinitrophenol	SVOA	340	U	340	340	U	340	340	U	340	340	U	340	340	U	340
2,4-Dinitrotoluene	SVOA	67	U	67	68	U	68	67	U	67	67	U	67	67	U	67
2,6-Dinitrotoluene	SVOA	29	U	29	29	U	29	28	U	28	29	U	29	29	U	29
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	20	U	20	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	13	U	13
2-Nitroaniline	SVOA	51	U	51	51	U	51	51	U	51	51	U	51	51	U	51
2-Nitrophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	92	U	92	93	U	93	91	U	91	92	U	92	92	U	92
3+4 Methylphenol (cresol, m+p)	SVOA	34	U	34	34	U	34	33	U	33	34	U	34	34	U	34
3-Nitroaniline	SVOA	74	U	74	75	U	75	74	U	74	75	U	75	74	U	74
4,6-Dinitro-2-methylphenol	SVOA	340	U	340	340	U	340	330	U	330	340	U	340	340	U	340
4-Bromophenylphenyl ether	SVOA	19	U	19	20	U	20	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	67	U	67	68	U	68	67	U	67	67	U	67	67	U	67
4-Chloroaniline	SVOA	84	U	84	84	U	84	83	U	83	84	U	84	83	U	83
4-Chlorophenylphenyl ether	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
4-Nitroaniline	SVOA	74	U	74	75	U	75	73	U	73	74	U	74	74	U	74
4-Nitrophenol	SVOA	99	U	99	100	U	100	98	U	98	99	U	99	99	U	99
Acenaphthene	SVOA	11	U	11	11	U	11	10	U	10	11	U	11	10	U	10
Acenaphthylene	SVOA	17	U	17	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	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	27	U	27	27	U	27	26	U	26	27	U	27	27	U	27
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	41	U	41	41	U	41	40	U	40	41	U	41	41	U	41
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	24	U	24	23	U	23	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	24	U	24	23	U	23	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	200	J	47	47	U	47	46	U	46	47	U	47	47	U	47
Butylbenzylphthalate	SVOA	44	U	44	44	U	44	43	U	43	44	U	44	44	U	44
Carbazole	SVOA	37	U	37	37	U	37	36	U	36	37	U	37	37	U	37
Chrysene	SVOA	28	U	28	28	U	28	27	U	27	28	U	28	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	20	U	20	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	21	U	21	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA	27	U	27	27	U	27	26	U	26	27	U	27	26	U	26
Dimethyl phthalate	SVOA	23	U	23	24	U	24	23	U	23	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	30	U	30	30	U	30	29	U	29	30	U	30	30	U	30
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	15	U	15	15	U	15	15	U	15
Fluoranthene	SVOA	37	U	37	37	U	37	36	U	36	37	U	37	37	U	37
Fluorene	SVOA	18	U	18	19	U	19	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	30	U	30	30	U	30	29	U	29	30	U	30	30	U	30
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	UX	10
Hexachlorocyclopentadiene	SVOA	51	U	51	51	U	51	51	U	51	51	U	51	51	U	51
Hexachloroethane	SVOA	22	U	22	22	UJ	22	22	UJ	22	22	UJ	22	22	UJX	22
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	23	U	23	22	U	22	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	32	U	32	32	U	32	31	U	31	32	U	32	32	U	32
Nitrobenzene	SVOA	22	U	22	23	U	23	22	U	22	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	32	U	32	32	U	32	31	U	31	32	U	32	32	U	32
N-Nitrosodiphenylamine	SVOA	21	U	21	22	U	22	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	340	U	340	340	U	340	330	U	330	340	U	340	340	U	340
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Phenol	SVOA	18	U	18	19	U	19	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	26	J	12	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	20 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	DZ-3 - J1V2K5			DZ-4 - J1V2K6			DZ-6 - J1V2K8			DZ-7 - J1V2K9			DZ-8 - J1V2L0		
		1/7/15			1/7/15			1/7/15			1/7/15			1/7/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	29	U	29	28	U	28	29	U	29	29	U	29
1,2-Dichlorobenzene	SVOA	22	UJ	22	23	UJ	23	22	UJ	22	23	UJ	23	22	UJ	22
1,3-Dichlorobenzene	SVOA	12	UJ	12	12	UJ	12	12	UJ	12	12	UJ	12	12	UJ	12
1,4-Dichlorobenzene	SVOA	14	UJ	14	14	UJ	14	14	UJ	14	14	UJ	14	14	UJ	14
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	67	U	67	68	U	68	66	U	66	68	U	68	67	U	67
2,4-Dinitrophenol	SVOA	340	U	340	350	U	350	330	U	330	350	U	350	340	U	340
2,4-Dinitrotoluene	SVOA	67	U	67	68	U	68	66	U	66	68	U	68	67	U	67
2,6-Dinitrotoluene	SVOA	28	U	28	29	U	29	28	U	28	29	U	29	29	U	29
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	22	U	22	21	U	21	22	U	22	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	20	U	20	19	U	19	20	U	20	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	51	U	51	52	U	52	50	U	50	52	U	52	51	U	51
2-Nitrophenol	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	91	U	91	93	U	93	90	U	90	93	U	93	92	U	92
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	34	U	34	33	U	33	34	U	34	34	U	34
3-Nitroaniline	SVOA	74	U	74	76	U	76	73	U	73	76	U	76	74	U	74
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	340	U	340	330	U	330	340	U	340	340	U	340
4-Bromophenylphenyl ether	SVOA	19	U	19	20	U	20	19	U	19	20	U	20	19	U	19
4-Chloro-3-methylphenol	SVOA	67	U	67	68	U	68	66	U	66	68	U	68	67	U	67
4-Chloroaniline	SVOA	83	U	83	85	U	85	82	U	82	85	U	85	84	U	84
4-Chlorophenylphenyl ether	SVOA	21	U	21	22	U	22	21	U	21	22	U	22	21	U	21
4-Nitroaniline	SVOA	73	U	73	75	U	75	73	U	73	75	U	75	74	U	74
4-Nitrophenol	SVOA	98	U	98	100	U	100	97	U	97	100	U	100	99	U	99
Acenaphthene	SVOA	10	U	10	11	U	11	10	U	10	11	U	11	11	U	11
Acenaphthylene	SVOA	17	U	17	18	U	18	17	U	17	18	U	18	17	U	17
Anthracene	SVOA	17	U	17	18	U	18	17	U	17	18	U	18	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	21	U	21	20	U	20	21	U	21	32	J	20
Benzo(a)pyrene	SVOA	20	U	20	21	U	21	20	U	20	21	U	21	20	U	20
Benzo(b)fluoranthene	SVOA	27	U	27	27	U	27	26	U	26	27	U	27	40	JK	27
Benzo(ghi)perylene	SVOA	16	U	16	17	U	17	16	U	16	17	U	17	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	42	U	42	40	U	40	41	U	41	41	UK	41
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	24	U	24	23	U	23	24	U	24	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	24	U	24	23	U	23	24	U	24	23	U	23
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	47	U	47	48	U	48	46	U	46	48	U	48	47	U	47
Butylbenzylphthalate	SVOA	44	U	44	45	U	45	43	U	43	45	U	45	44	U	44
Carbazole	SVOA	36	U	36	37	U	37	36	U	36	37	U	37	37	U	37
Chrysene	SVOA	27	U	27	28	U	28	27	U	27	28	U	28	43	J	28
Dibenz[a,h]anthracene	SVOA	19	U	19	20	U	20	19	U	19	20	U	20	19	U	19
Dibenzofuran	SVOA	20	U	20	21	U	21	20	U	20	21	U	21	20	U	20
Diethyl phthalate	SVOA	26	U	26	27	U	27	26	U	26	27	U	27	27	U	27
Dimethyl phthalate	SVOA	23	U	23	24	U	24	23	U	23	24	U	24	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	30	U	30	29	U	29	30	U	30	30	U	30
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	14	U	14	15	U	15	15	U	15
Fluoranthene	SVOA	36	U	36	37	U	37	36	U	36	37	U	37	58	J	37
Fluorene	SVOA	18	U	18	19	U	19	18	U	18	19	U	19	18	U	18
Hexachlorobenzene	SVOA	29	U	29	30	U	30	29	U	29	30	U	30	30	U	30
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	51	U	51	52	U	52	50	U	50	52	U	52	51	U	51
Hexachloroethane	SVOA	22	UJ	22	22	UJ	22	21	UJ	21	22	UJ	22	22	UJ	22
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	23	U	23	22	U	22	23	U	23	22	U	22
Isophorone	SVOA	17	U	17	18	U	18	17	U	17	18	U	18	17	U	17
Naphthalene	SVOA	31	U	31	32	U	32	31	U	31	32	U	32	32	U	32
Nitrobenzene	SVOA	22	U	22	23	U	23	22	U	22	23	U	23	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	32	U	32	31	U	31	32	U	32	32	U	32
N-Nitrosodiphenylamine	SVOA	21	U	21	22	U	22	21	U	21	22	U	22	21	U	21
Pentachlorophenol	SVOA	330	U	330	340	U	340	330	U	330	340	U	340	340	U	340
Phenanthrene	SVOA	17	U	17	18	U	18	17	U	17	18	U	18	17	U	17
Phenol	SVOA	18	U	18	19	U	19	18	U	18	19	U	19	18	U	18
Pyrene	SVOA	12	U	12	13	U	13	12	U	12	13	U	13	55	J	12

Attachment	1	Sheet No.	21 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	DZ-9 - J1V2L1			DZ-10 - J1V2L2			DZ-11 - J1V2L3			DZ-12 - J1V2L4			Equipment Blank - J1V2M9		
		1/7/15			1/7/15			1/7/15			1/7/15			1/6/15		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	29	U	29	29	U	29	29	U	29	29	U	29	26	U	26
1,2-Dichlorobenzene	SVOA	23	UJ	23	23	UJ	23	23	UJ	23	23	UJ	23	21	U	21
1,3-Dichlorobenzene	SVOA	13	UJ	13	13	UJ	13	13	UJ	13	12	UJ	12	11	U	11
1,4-Dichlorobenzene	SVOA	14	UJ	14	14	UJ	14	14	UJ	14	14	UJ	14	13	U	13
2,4,5-Trichlorophenol	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4,6-Trichlorophenol	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4-Dichlorophenol	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2,4-Dimethylphenol	SVOA	69	U	69	69	U	69	69	U	69	68	U	68	62	U	62
2,4-Dinitrophenol	SVOA	350	U	350	350	U	350	350	U	350	340	U	340	310	U	310
2,4-Dinitrotoluene	SVOA	69	U	69	69	U	69	69	U	69	68	U	68	62	U	62
2,6-Dinitrotoluene	SVOA	29	U	29	29	U	29	29	U	29	29	U	29	26	U	26
2-Chloronaphthalene	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
2-Chlorophenol	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	20	U	20
2-Methylnaphthalene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	18	U	18
2-Methylphenol (cresol, o-)	SVOA	14	U	14	14	U	14	14	U	14	13	U	13	12	U	12
2-Nitroaniline	SVOA	53	U	53	52	U	52	52	U	52	52	U	52	47	U	47
2-Nitrophenol	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
3,3'-Dichlorobenzidine	SVOA	95	U	95	94	U	94	94	U	94	93	U	93	84	U	84
3+4 Methylphenol (cresol, m+p)	SVOA	35	U	35	35	U	35	35	U	35	34	U	34	31	U	31
3-Nitroaniline	SVOA	77	U	77	77	U	77	77	U	77	76	U	76	68	U	68
4,6-Dinitro-2-methylphenol	SVOA	350	U	350	350	U	350	350	U	350	340	U	340	310	U	310
4-Bromophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	18	U	18
4-Chloro-3-methylphenol	SVOA	69	U	69	69	U	69	69	U	69	68	U	68	62	U	62
4-Chloroaniline	SVOA	86	U	86	86	U	86	86	U	86	85	U	85	77	U	77
4-Chlorophenylphenyl ether	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	20	U	20
4-Nitroaniline	SVOA	76	U	76	76	U	76	76	U	76	75	U	75	68	U	68
4-Nitrophenol	SVOA	100	U	100	100	U	100	100	U	100	100	U	100	91	U	91
Acenaphthene	SVOA	11	U	11	11	U	11	11	U	11	11	U	11	9.6	U	9.6
Acenaphthylene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	16	U	16
Anthracene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	16	U	16
Benzo(a)anthracene	SVOA	21	U	21	21	U	21	40	J	21	21	U	21	19	U	19
Benzo(a)pyrene	SVOA	21	U	21	21	U	21	34	J	21	21	U	21	19	U	19
Benzo(b)fluoranthene	SVOA	28	U	28	27	U	27	27	U	27	27	U	27	25	U	25
Benzo(ghi)perylene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	15	U	15
Benzo(k)fluoranthene	SVOA	42	U	42	42	U	42	42	U	42	41	U	41	37	U	37
Bis(2-chloro-1-methylethyl)ether	SVOA	24	U	24	24	U	24	24	U	24	24	U	24	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	24	U	24	24	U	24	24	U	24	24	U	24	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	48	U	48	48	U	48	48	U	48	48	U	48	43	U	43
Butylbenzylphthalate	SVOA	45	U	45	45	U	45	45	U	45	45	U	45	40	U	40
Carbazole	SVOA	38	U	38	38	U	38	38	U	38	37	U	37	34	U	34
Chrysene	SVOA	28	U	28	28	U	28	48	J	28	28	U	28	25	U	25
Dibenz[a,h]anthracene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	18	U	18
Dibenzofuran	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	19	U	19
Diethyl phthalate	SVOA	27	U	27	27	U	27	27	U	27	27	U	27	24	U	24
Dimethyl phthalate	SVOA	24	U	24	24	U	24	24	U	24	24	U	24	22	U	22
Di-n-butylphthalate	SVOA	30	U	30	30	U	30	30	U	30	30	U	30	27	U	27
Di-n-octylphthalate	SVOA	15	U	15	15	U	15	15	U	15	15	U	15	13	U	13
Fluoranthene	SVOA	38	U	38	38	U	38	72	J	38	37	U	37	34	U	34
Fluorene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	17	U	17
Hexachlorobenzene	SVOA	30	U	30	30	U	30	30	U	30	30	U	30	27	U	27
Hexachlorobutadiene	SVOA	11	U	11	10	U	10	10	U	10	10	U	10	9.4	U	9.4
Hexachlorocyclopentadiene	SVOA	53	U	53	52	U	52	52	U	52	52	U	52	47	U	47
Hexachloroethane	SVOA	22	UJ	22	22	UJ	22	22	UJ	22	22	UJ	22	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	23	U	23	23	U	23	23	U	23	23	U	23	21	U	21
Isophorone	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	16	U	16
Naphthalene	SVOA	33	U	33	32	U	32	33	U	33	32	U	32	29	U	29
Nitrobenzene	SVOA	23	U	23	23	U	23	23	U	23	23	U	23	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	33	U	33	32	U	32	33	U	33	32	U	32	29	U	29
N-Nitrosodiphenylamine	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	20	U	20
Pentachlorophenol	SVOA	350	U	350	350	U	350	350	U	350	340	U	340	310	U	310
Phenanthrene	SVOA	18	U	18	18	U	18	43	J	18	18	U	18	16	U	16
Phenol	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	17	U	17
Pyrene	SVOA	13	U	13	13	U	13	77	J	13	21	J	13	11	U	11

Attachment	1	Sheet No.	22 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Attachment 1. 100-D-86:1 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	Equipment Blank - J1V2K2 1/7/15		
		ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8
2,4-Dichlorophenol	SVOA	9.8	U	9.8
2,4-Dimethylphenol	SVOA	65	U	65
2,4-Dinitrophenol	SVOA	330	U	330
2,4-Dinitrotoluene	SVOA	65	U	65
2,6-Dinitrotoluene	SVOA	27	U	27
2-Chloronaphthalene	SVOA	9.8	U	9.8
2-Chlorophenol	SVOA	21	U	21
2-Methylnaphthalene	SVOA	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13
2-Nitroaniline	SVOA	49	U	49
2-Nitrophenol	SVOA	9.8	U	9.8
3,3'-Dichlorobenzidine	SVOA	88	U	88
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32
3-Nitroaniline	SVOA	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19
4-Chloro-3-methylphenol	SVOA	65	U	65
4-Chloroaniline	SVOA	80	U	80
4-Chlorophenylphenyl ether	SVOA	21	U	21
4-Nitroaniline	SVOA	71	U	71
4-Nitrophenol	SVOA	95	U	95
Acenaphthene	SVOA	10	U	10
Acenaphthylene	SVOA	17	U	17
Anthracene	SVOA	17	U	17
Benzo(a)anthracene	SVOA	20	U	20
Benzo(a)pyrene	SVOA	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45
Butylbenzylphthalate	SVOA	42	U	42
Carbazole	SVOA	35	U	35
Chrysene	SVOA	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19
Dibenzofuran	SVOA	20	U	20
Diethyl phthalate	SVOA	25	U	25
Dimethyl phthalate	SVOA	23	U	23
Di-n-butylphthalate	SVOA	28	U	28
Di-n-octylphthalate	SVOA	14	U	14
Fluoranthene	SVOA	35	U	35
Fluorene	SVOA	18	U	18
Hexachlorobenzene	SVOA	28	U	28
Hexachlorobutadiene	SVOA	9.8	U	9.8
Hexachlorocyclopentadiene	SVOA	49	U	49
Hexachloroethane	SVOA	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22
Isophorone	SVOA	17	U	17
Naphthalene	SVOA	30	U	30
Nitrobenzene	SVOA	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21
Pentachlorophenol	SVOA	320	U	320
Phenanthrene	SVOA	17	U	17
Phenol	SVOA	18	U	18
Pyrene	SVOA	12	U	12

Attachment	1	Sheet No.	23 of 23
Originator	J. D. Skoglie	Date	3/3/15
Checked	I. B. Berezovskiy	Date	3/3/15
Calc. No.	0100D-CA-V0586	Rev. No.	0
		Job No.	14655

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0587

Subject: 100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations

Computer Program: Excel Program No: Excel 2010

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 6 Total = 7	J. D. Skoglie	I. B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	6/11/15

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/09/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/09/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	1 of 6

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-D-86:1 subsite. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009b), the following criteria must be met:

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

This calculation also provides documentation to support the calculation of the sum of fractions evaluation for radionuclide direct exposure risk. Attainment of direct exposure remedial action goals (RAGs) is demonstrated using the single-radionuclide dose-equivalence lookup values to perform sum of fractions evaluations for comparison of the total radionuclide dose to the RAG of 15 mrem/yr above background. The model used to develop these dose-equivalence lookup values is presented in Appendix G of the 100 Area RDR/RAWP (DOE-RL 2009b).

GIVEN/REFERENCES:

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

2) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 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, 2015, *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculation*, 0100D-CA-V0586, Rev. 0, Washington Closure Hanford, Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/09/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/09/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	2 of 6

Summation of Fractions

The sum-of-fractions compares the radionuclide cleanup verification results from the 100-D-86:1 subsite shallow zone and overburden decision units to direct exposure single radionuclide 15 mrem/yr dose-equivalence values and shows the sum-of-fractions evaluation for comparison of the total radionuclide dose to the RAG of 15 mrem/yr above background. Direct exposure does not apply to the deep zone decision unit. The first two columns of the table present the COPCs and the maximum radionuclide activities for the samples. Background values (DOE-RL 2009b) are presented in the third column. Uranium background is subtracted from the analyses for all soil samples; however, background for other radionuclides is only subtracted from the overburden soil analysis. The fourth column presents the radionuclide activities corrected for background. The fifth column presents the single radionuclide 15 mrem/yr dose-equivalence activities, and the last column presents the background-corrected radionuclide activities divided by the dose-equivalence activities, followed by the sum of the fractions and determination of the total waste site dose for comparison to the 15 mrem/yr RAG.

METHODOLOGY:

The 100-D-86:1 subsite is comprised of three decision units for verification sampling; the shallow zone, overburden, and deep zone. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-86:1 subsite was conservatively calculated for the shallow zone and overburden areas only using the greater of the statistical or maximum value for each analyte within those two decision units from WCH (2015). Because the deep zone decision unit is >15 feet below ground surface (bgs) it is not calculated in the direct exposure scenario. Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, molybdenum, the detected semivolatile organic compounds (SVOCs), the detected polycyclic aromatic hydrocarbons (PAHs), and the detected polychlorinated biphenyls (PCBs) require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Although total petroleum hydrocarbons (diesel range extended) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 1.2 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 1.7×10^{-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 5.5×10^{-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, then multiplied by 1.0×10^{-6}. For example, the statistical value for hexavalent chromium is 0.268 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 1.3×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criterion is met.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/13/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/13/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	3 of 6

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 1.3×10^{-6}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

Summation of Fractions

The sum-of-fractions were calculated for the data set for the shallow zone and overburden decision units using the greater of the statistical or maximum value for each radionuclide COPC from the 95% upper confidence limit (UCL) calculation (WCH 2015) for each decision unit.

Calculations for 100-D-86:1 subsite decision units were performed using RAGs from the 100 Area RDR/RAWP (DOE/RL 2009b). An example of the sum of fractions calculation of COPCs is presented below:

1) To calculate the fraction for europium-152 in the overburden decision unit, the background value of 0 pCi/g is subtracted from the statisical value from the data set of 0.0524 pCi/g, resulting in a corrected maximum value of 0.0524 pCi/g for europium-155. The background corrected value is divided by the soil activity equivalent of 3.3 pCi/g equivalent to a 15 mrem/yr dose, resulting in a fraction of 0.0159.

2) The fractions for the remaining COPCs are determined and summed. The sum of these fractions equals 0.0523. The sum of fractions is then multiplied by 15 mrem/yr to determine the total equivalent dose of 0.785 mrem/yr for the 100-D-86:1 subsite overburden decision unit. Comparing this value to the dose limit of <15 mrem/yr, the requirement is met.

RESULTS:

Hazard Quotient and Excess Cancer Risk Calculations

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.

Summation of Fractions

As demonstrated by the determinations of the sums of fractions for the overburden and shallow zone decision units in Table 2 and Table 3, respectively, the maximum cumulative dose values contributed by the residual radionuclide populations (0.785 mrem/yr for the overburden and 1.26 mrem/yr for the shallow zone) are predicted to be less than the RAG of 15 mrem/yr above background.

Tables 2 and 3 show the results of the sum of fractions evaluations for radionuclide direct exposure dose for the overburden and shallow zone decision units.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/09/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/09/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	4 of 6

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-D-86:1 Subsite.

Contaminants of Potential Concern	Maximum or Statistical Value [a] (mg/kg)	Noncarcinogen RAG [b] (mg/kg)	Hazard Quotient	Carcinogen RAG [b] (mg/kg)	Carcinogen Risk
Metals					
Boron	1.2	7,200	1.7E-04	--	--
Chromium, hexavalent [c]	0.268	240	1.1E-03	2.1	1.3E-07
Molybdenum	0.32	400	8.0E-04	--	--
Semivolatiles					
Bis(2-ethylhexyl) phthalate	0.20	1600	1.3E-04	71.4	2.8E-09
Carbazole	0.087	--	--	50	1.7E-09
Dibenzofuran	0.061	160	3.8E-04	--	--
Di-n-butylphthalate	0.038	8,000	4.8E-06	--	--
Polyaromatic Hydrocarbons					
Acenaphthene	0.045	4800	9.4E-06	--	--
Benzo(a)anthracene	0.073	--	--	1.37	5.3E-08
Benzo(a)pyrene	0.078	--	--	0.137	5.7E-07
Benzo(b)fluoranthene	0.043	--	--	1.37	3.1E-08
Benzo(ghi)perylene [d]	0.15	2400	6.3E-05	--	--
Benzo(k)fluoranthene	0.021	--	--	1.37	1.5E-08
Chrysene	0.081	--	--	13.7	5.9E-09
Dibenz(a,h)anthracene	0.041	--	--	1.37	3.0E-08
Fluoranthene	0.14	3,200	4.4E-05	--	--
Fluorene	0.044	3,200	1.4E-05	--	--
Indeno(1,2,3-cd)pyrene	0.16	--	--	1.37	1.2E-07
Phenanthrene [d]	0.076	24000	3.2E-06	--	--
Pyrene	0.18	2,400	7.5E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.084	1.6	5.3E-02	0.5	1.7E-07
Aroclor-1260	0.065	--	--	0.5	1.3E-07
Total Petroleum Hydrocarbons					
TPH - diesel range extended [e]	78	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**5.5E-02**		
Cumulative Excess Cancer Risk:					**1.3E-06**

Notes:

[a] = From WCH (2015).

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

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

[d] = Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals.

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

phenanthrene surrogate: anthracene

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

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/13/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/13/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	5 of 6

Table 2. 100-D-86:1 Subsite Overburden Sum of Fractions Prediction of Maximum Radionuclide Dose.

COPC	95% UCL Statistical or Maximum Values (pCi/g)	Background (pCi/g) [a]	Maximum Value (Background Corrected) (pCi/g)	Soil Activity for 15 mrem/yr Dose (pCi/g) [b]	Fraction
Cesium-137	0.382	1.1	0.0	6.2	0.0
Europium-152	0.0524	0.0	0.0524	3.3	0.0159
Europium-155	0.0354	0.054	0.0	125	0.0
Total beta radiostrontium	0.344	0.18	0.164	4.5	0.0364
Uranium-234	0.219	1.1	0.0	1.1	0.0
Uranium-238	0.192	1.1	0.0	1.1	0.0
				Sum of Fractions	0.0523
				Equivalent Dose (mrem/yr)	0.785

[a] Background is subtracted from all uranium isotopes regardless of the decision unit they were detected in. However, background is subtracted from all other isotopes only if they were detected in the overburden decision unit.

[b] Single radionuclide 15 mrem/yr dose-equivalence values and methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009b).

COPC = contaminant of potential concern

Table 3. 100-D-86:1 Subsite Shallow Zone Sum of Fractions Prediction of Maximum Radionuclide Dose.

COPC	95% UCL Statistical or Maximum Values (pCi/g)	Background (pCi/g) [a]	Maximum Value (Background Corrected) (pCi/g)	Soil Activity for 15 mrem/yr Dose (pCi/g) [b]	Fraction
Cesium-137	0.199	NA	0.199	6.2	0.0321
Europium-155	0.0423	NA	0.0423	125	0.000338
Total beta radiostrontium	0.232	NA	0.232	4.5	0.0516
Uranium-234	0.173	1.1	0.0	1.1	0.0
Uranium-238	0.196	1.1	0.0	1.1	0.0
				Sum of Fractions	0.0840
				Equivalent Dose (mrem/yr)	1.26

[a] Background is subtracted from all uranium isotopes regardless of the decision unit they were detected in. However, background is subtracted from all other isotopes only if they were detected in the overburden decision unit.

[b] Single radionuclide 15 mrem/yr dose-equivalence values and methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009b).

COPC = contaminant of potential concern.

NA = Not applicable (background for these isotopes is only subtracted from overburden analyses).

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	04/13/15	Calc. No.:	0100D-CA-V0587	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	04/13/15
Subject:	100-D-86:1 Subsite Direct Contact Hazard Quotient, Carcinogenic Risk, and Sum of Fractions Calculations					Sheet No.	6 of 6

CONCLUSION:

The calculations in Tables 1, 2, and 3 demonstrate that the 100-D-86:1 subsite meets the requirements for the direct contact hazard quotient, carcinogenic (excess cancer) risk, and radionuclide direct exposure dose as identified in the RDR/RAWP (DOE-RL 2009b) and SAP (DOE-RL 2009a). The direct contact hazard quotient, carcinogenic (excess cancer) risk calculations, and the sum of fractions evaluation for radionuclide direct exposure dose are for use in the RSVP for the 100-D-86:1 subsite.

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CALCULATION COVER SHEET

Project Title: 100-D Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0588

Subject: 100-D-86:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater

Computer Program: Excel Program No: Excel 2010

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 3 Total = 4	J. D. Skoglie	I.B. Berezovskiy	R. J. Nielson	S. G. Wilkinson	6/1/15

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/16/2015	Calc. No.:	0100D-CA-V0588	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/16/2015
Subject:	100-D-86:1 Subsite 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-86:1 subsite. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ 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, 2015, *100-D-86:1 Subsite Cleanup Verification 95% UCL Calculations*, 0100D-CA-V0586, 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:	J. D. Skoglie	Date:	4/9/2015	Calc. No.:	0100D-CA-V0588	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	4/9/2015
Subject:	100-D-86:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No.	2 of 3

METHODOLOGY:

The 100-D-86:1 subsite is comprised of three decision units for verification sampling; shallow zone, overburden, and deep zone. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-D-86:1 subsite 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 2015). Based on the generic site RESRAD model (BHI 2005) and a vadose zone of approximately 18 m (59 ft) thickness, a K_d of 4.1 or greater is required to show no predicted migration to groundwater in 1,000 years. Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, and the detected semivolatile organic compounds (SVOC) 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 this model. Additionally, arsenic was detected above background; however, the standard for this contaminant is not toxicity based, therefore a groundwater HQ is not calculated. All other site nonradionuclide COPCs were not detected, quantified below background levels, or has a K_d greater than or equal to 4.1 mL/g. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (mg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720(3)(a)(ii)(A), 1996) x 100 x 1 mg/1000 mg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the maximum value for boron is 1.2 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 3.8×10^{-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-86:1 subsite is 6.0×10^{-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}. For example the maximum value for carbazole is 0.087 mg/kg, divided by 0.438, and multiplied by 1×10^{-6} is 2.0×10^{-7}. Therefore, the requirement of $<1 \times 10^{-6}$ is met. Carbazole was the only analyte detected with a carcinogenic RAG. Therefore, the individual cancer risk and the cumulative cancer risk are the same. The criterion for cumulative excess cancer risk for carcinogens of $<1 \times 10^{-5}$ 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 groundwater 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:	J. D. Skoglie	Date:	6/11/2015	Calc. No.:	0100D-CA-V0588	Rev.:	X0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	6/11/2015
Subject:	100-D-86:1 Subsite 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-86:1 Subsite.

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	1.2	320	3.8E-03	--	--
Chromium, hexavalent	0.268	4.8	5.6E-02	--	--
Semivolatiles					
Carbazole	0.087	--	--	0.438	2.0E-07
Di-n-butylphthalate	0.038	160	2.4E-04	--	--
Totals					
Cumulative Hazard Quotient:			**6.0E-02**		
Cumulative Excess Cancer Risk:					**2.0E-07**

Notes:

[a] = From WCH (2015).

[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-86:1 subsite 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 D

DATA QUALITY ASSESSMENT

APPENDIX D

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2014b). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2009).

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

To ensure quality data, the 100 Area SAP (DOE-RL 2009) data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) 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 data from samples collected at the 100-D-86:1 subsite were provided by the laboratories in three sample delivery groups (SDGs): JP0889, JP0890, and JP0891. SDG JP0891 was submitted for third-party validation. No major deficiencies were identified in the 100-D-86:1 data set. Minor deficiencies are discussed for the data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

MINOR DEFICIENCIES

SDG JP0889

This SDG comprises 14 statistical soil samples (J1V2L6 through J1V2L9, J1V2M0 through J1V2M9) collected from the 100-D-86:1 overburden area. This SDG includes one field duplicate pair (J1V2L6/J1V2L8). All samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and gamma spectroscopy (GEA) with the exception of sample J1V2M9, the equipment blank, which was analyzed for ICP metals, mercury, semivolatile organic analysis (SVOA), and PAH. Minor deficiencies are as follows.

In the PAH analysis, the glass jar submitted to the laboratory for PAH analysis of sample J1V2M9 was broken during transport to the laboratory. The laboratory transferred the contents of the jar to a new container while retaining sufficient material to perform the analysis. The recovered sample material was reported by the laboratory as "unexposed/uncompromised." However, a broken sample jar is outside the sample handling protocol. All PAH results for sample J1V2M9 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the analytes benzo(b)fluoranthene and benzo(k)fluoranthene were unresolved in sample J1V2M9. The laboratory identified matrix interference as the cause of this deficiency. The laboratory reported the combined peak as benzo(b)fluoranthene and reported benzo(k)fluoranthene as undetected. The laboratory qualified all of the associated data with "K" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the matrix spike (MS)/matrix spike duplicate (MSD) recoveries for several compounds are outside the quality control (QC) limits. The laboratory has qualified the associated results with "T" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PCB analysis, the analytes aroclor-1254 and aroclor-1260 were not sufficiently resolved in samples J1V2L6, J1V2L7, J1V2L8, J1V2M0, J1V2M2, J1V2M3, J1V2M4, J1V2M5, J1V2M6, J1V2M7, and J1V2M8 to report separately. The laboratory has reported the double peak and the predominant aroclor. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PCB analysis, the MS/MSD exhibited analyte recoveries outside the QC limits. The laboratory has qualified all of the associated results with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, the laboratory control sample (LCS) recovery for dibenzo(a,h)anthracene (82%) is just below the lower limit of the laboratories QC range (83%) but is above the projects lower QC limit (70%). The laboratory has qualified the associated data with "N" flags. The data are usable for decision-making purposes.

In the PAH analysis, the relative percent difference (RPD) calculated between the primary and confirmatory columns exceeds the QC limit for some analytes. The laboratory has qualified the associated data with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, the MS/MSD recoveries for some analytes are outside the QC limits. The laboratory has qualified the associated data with "N" flags. Acceptable LCS recoveries indicate the analytical system was operating within control. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory identified physical and chemical interferences for several elements. The associated data have been qualified with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of calcium, magnesium, and nickel were identified in the method blank (MB). These detections were less than the reporting limit. There is no impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon is outside the QC limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the mercury analysis, the RPD calculated for mercury in the method duplicate is outside the QC limits. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0890

This SDG comprises 14 statistical soil samples (J1V2H9, J1V2J0 through J1V2J9, J1V2K0 through J1V2K2) collected from the 100-D-86:1 shallow zone. This SDG includes one field duplicate pair (J1V2J2/J1V2K1). All samples were analyzed for ICP metals, mercury, hexavalent chromium, PAH, PCBs, SVOCs, TPH, carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and GEA with the exception of sample J1V2K2, the equipment blank, which was analyzed for ICP metals, mercury, SVOA, and PAH. Minor deficiencies are as follows.

In the SVOC analysis, surrogate recoveries for sample J1V2J0 are slightly below the QC limits in the sample analysis and in the analysis of the MS prepared from the sample. These results are likely due to matrix interference, which was not observed in any of the other samples in this set. Results for sample J1V2J0 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS recoveries were reported outside the QC limits. The laboratory has qualified the associated data with "T" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PCB analysis, the analytes aroclor-1254 and aroclor-1260 were not sufficiently resolved in samples J1V2J0, J1V2J1, J1V2J5, J1V2J6, J1V2J7, and J1V2J8 to report separately. The laboratory has reported the double peak and the predominant aroclor. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, RPD calculated between the primary and confirmatory columns exceeds the QC limit for some analytes. The laboratory has qualified the associated data with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, the MS/MSD recoveries for some analytes are outside the QC limits. The laboratory has qualified the associated data with "N" flags. Acceptable LCS recoveries indicate the analytical system was operating within control. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory identified physical and chemical interferences for several elements. The associated data have been qualified with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of barium calcium, magnesium, and manganese were identified in the MB. These detections were less than the reporting limit. There is no impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, iron, a common laboratory contaminant, was detected above the reporting limit in the MB. The associated field sample results are all more than 20 times greater than the MB result. There is no impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for silicon is outside the QC limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the mercury analysis, the RPD calculated for mercury in the method duplicate is outside the QC limits. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0891

This SDG comprises 13 statistical soil samples (J1V2K3 through J1V2K9, J1V2L0 through J1V2L5) collected from the 100-D-86:1 deep zone. This SDG includes one field duplicate pair (J1V2K7/J1V2L5). All samples were analyzed for ICP metals, mercury, hexavalent chromium, PAH, PCBs, SVOCs, TPH, carbon-14, strontium-90, tritium, isotopic plutonium, isotopic uranium, and GEA, with the exception of sample J1V2K2, the equipment blank, which was analyzed for ICP metals, mercury, SVOA and PAH. SDG JP0891 was submitted for third-party validation. Minor deficiencies are as follows.

In the ICP metals analysis, the MS recoveries for arsenic (68%), boron (68%), selenium (69%), zinc (68%), antimony (55%), and silicon (32%) are outside the QC limits. Third-party validation qualified the associated data as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon (10%) is outside the QC limits. Third-party validation qualified all silicon results in SDG JP0891 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the radiochemical analyses, the radiochemical yield (106%) from sample J1V2L5 is outside the QC limits. Third-party validation qualified the uranium-234 and uranium-238 results in sample J1V2L5 as estimated with "J" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the radiochemical analyses, no MS samples were prepared for carbon-14 or tritium. Third-party validation qualified all carbon-14 and tritium results in SDG JP0891 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the radiochemical analyses, no LCSs were prepared for plutonium-238 and uranium-235. Third-party validation qualified all plutonium-238 and uranium-235 results in SDG JP0891 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, MS recoveries for 1,2-dichlorobenzene (47%), 1,3-dichlorobenzene (44%), 1,4-dichlorobenzene (46%), and hexachloroethane (44%) are outside the QC limits. Third-party validation qualified all results for these analytes in SDG JP0891 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 quality assurance (QA)/QC measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbook (WCH 2014a), are shown in Table D-1. The main and QA/QC sample results are presented in Appendix C.

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

Sample Area	Main Sample	Duplicate Sample
Excavation Area shallow zone	J1V2J2	J1V2K1
Excavation Area deep zone	J1V2K7	J1V2L5
Overburden	J1V2L6	J1V2M8

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the sample/duplicate pair(s) for each contaminant of potential concern. Relative percent differences are not calculated for analytes that are not detected in both the main and duplicate sample at more than five times the target detection limit. Relative percent differences of analytes detected at low concentrations (less than five times the detection limit) are not considered to be

indicative of the analytical system performance. The calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation.

Only the RPD calculated for silicon (56%) in the overburden field duplicate sample is above the acceptance criteria (30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control. The data are usable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit, including undetected analytes. In these cases, a control limit of ±2 times the target detection limit is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. None of the data was flagged for 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-86:1 subsite verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-D-86:1 subsite concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes.

The verification sample analytical data are stored in the Washington Closure Hanford project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The verification sample analytical data are also summarized in Appendix C.

REFERENCES

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

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