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

13-AMRP-0158

APR 22 2013

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 100-D-50:1 EMERGENCY DISCHARGE PIPELINE, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2012-101 and supporting documentation for the "Remaining Sites Verification Package for the 100-D-50:1 Emergency Discharge Pipeline," Rev.0. If you have questions, please contact me or your staff may contact Tom Post, of my staff, at (509) 376-3232.

Sincerely,

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

AMRP:TCP

Attachment

cc w/attach:
N. M. Menard, Ecology
Administrative Record, H6-08

cc w/o attach:
R. D. Cantwell, WCH
S. L. Feaster, WCH
T. Q. Howell, WCH
D. L. Plung, WCH
J. P. Shearer, CHPRC

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2012-101

Waste Site Code(s)/Subsite Code(s): 100-D-50:1

Reclassification Category: Interim ☒ Final ☐

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

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-50:1 Emergency Discharge Pipeline subsite is part of the 100-D-50 waste site, which was divided into 10 separate subsites for purposes of environmental evaluation and response. The 100-D-50:1 subsite encompassed the process and storm sewer collection main pipeline for the southern portion of the 100-D/DR Area, which also served as an emergency discharge line for the 105-DR Reactor.

Confirmatory sampling, remediation, and verification sampling of the 100-D-50:1 subsite have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100 FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999). Confirmatory sampling was performed in December 2005, and January and April 2006. Test pits were excavated at manholes within each of four service areas. A portion of the pipeline, Service Area 2, was recommended for remove, treat, and disposal based on consideration of confirmatory sampling results from the 100-D-50:1 and 100-D-50:6 subsites and discussions with the U.S. Department of Energy, Richland Operations Office, and the Washington State Department of Ecology (Ecology).

Deep zone remediation of Service Area 2 of the 100-D-50:1 pipeline subsite was performed from February 14 through March 6, 2012, with removal of approximately 1,350 bank cubic meters (1,800 bank cubic yards) of potentially contaminated soil, concrete, and piping for disposal at the Environmental Restoration Disposal Facility. Verification sample results from the Service Area 2 remediation in August and September 2012 demonstrated that residual contaminant concentrations are protective of human health, groundwater, and the Columbia River. The selected action involved: (1) evaluating the site using available process information and confirmatory sampling data, (2) remediating the section of pipeline determined to require action, (3) demonstrating through confirmatory and verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the confirmatory and verification sampling results 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 Remaining Sites ROD (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated. Therefore, institutional controls to prevent uncontrolled excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-50:1 Emergency Discharge Pipeline* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2012-101

Waste Site Code(s)/Subsite Code(s): 100-D-50:1

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:

Deed restrictions to prevent uncontrolled drilling or excavation into the deep zone (greater than 4.6 m [15 ft] below ground surface) are required.

J. P. Neath	JP Neath	3/14/13
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	3/22/13
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-50:1 EMERGENCY DISCHARGE PIPELINE

Attachment to Waste Site Reclassification Form 2012-101

April 2013

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-50:1 EMERGENCY DISCHARGE PIPELINE

EXECUTIVE SUMMARY

The 100-D-50:1 Emergency Discharge Pipeline subsite is part of the 100-D-50 site, which was divided into 10 separate subsites for purposes of environmental evaluation and response. The 100-D-50:1 subsite, located within the 100-DR-1 Operable Unit, consists of the process and storm sewer collection main pipeline for the southern portion of the 100-D/DR Area and also served as an emergency discharge line for the 105-DR Reactor. This pipeline received radiological discharges from the reactor building, stormwater runoff, and cooling water treatment drainage.

Confirmatory sampling of the 100-D-50:1 subsite was conducted in December 2005, and January and April 2006 per the *Work Instruction for 100-D-50:1 Emergency Discharge Pipeline* (WCH 2005c). The sample design defined four service areas based on the direction of flow in the pipelines and the facilities being serviced by the pipelines. Test pits were excavated at manholes within each of the four service areas.

Evaluation of the confirmatory results indicated that the 100-D-50:1 subsite met the remedial action objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). Residual contamination at the 100-D-50:1 subsite exists entirely in the deep zone and therefore is not considered within the direct exposure scenario. The results of confirmatory sampling demonstrated that residual contaminant concentrations are protective of groundwater and the Columbia River with institutional controls to prevent unrestricted drilling/excavation into the pipeline. However, in discussions with the U.S. Department of Energy, Richland Operations Office, and the Washington State Department of Ecology, Service Area 2 was recommended for remediation. Service Area 2 would have received hexavalent chromium-contaminated discharges from the 183-DR facility via the 100-D-50:6 pipeline. Confirmatory sampling of the 100-D-50:6, 183-DR Clearwell Pipelines had shown elevated hexavalent chromium in pipe sediment/scale collected upstream of 100-D-50:1 Service Area 2 (WCH 2006b).

Remediation of 100-D-50:1 Service Area 2 was performed from February 14 through March 6, 2012. The excavation extended to a depth of 7.5 m (25 ft) below ground surface (bgs) along the length of the pipeline segment. Approximately 17,000 bank cubic meters (BCM) (22,000 bank cubic yards [BCY]) of overburden material was placed in five stockpiles while 1,350 BCM (1,800 BCY) of potentially contaminated soil, concrete, and piping was excavated and stockpiled in two staging pile areas for disposal at the Environmental Restoration Disposal Facility.

Verification sampling at the 100-D-50:1 Service Area 2 remediation area was conducted on August 30 and September 4, 2012, per the *Work Instruction for Verification Sampling of the 100-D-50:1, Emergency Discharge Pipeline* (WCH 2012d). The results indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). A summary of the cleanup evaluation for the soil results from both the confirmatory and verification sampling against the applicable criteria is presented in Table ES-1. The results of both the confirmatory and verification sampling are used to make reclassification decisions for the 100-D-50:1 subsite in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

Table ES-1. Summary of Remedial Action Goals for the 100-D-50:1 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain dose rate of <15 mrem/yr above background for 1,000 years.	All individual radionuclide COC/COPC concentrations in shallow zone decision units are below direct exposure RAGs.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations in shallow zone decision units are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotient determined from shallow zone decision units is <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient determined from shallow zone decision units (5.3×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for carcinogens determined from shallow zone decision units is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk determined from shallow zone decision units (1.7×10^{-8}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	Tritium is calculated to reach groundwater within the 1,000 years of the RESRAD analysis. However, tritium is not predicted to migrate to groundwater, and thus the Columbia River, at an activity exceeding the groundwater or river criteria. Therefore, residual tritium achieves the remedial action objectives for groundwater and river protection.	Yes
	Attain national primary drinking water standards [a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	All organ-specific doses are well below the 4 mrem/yr dose standard.	
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5 [b].	No nonuranium alpha-emitting radionuclides were detected.	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L) [c].	Uranium activities are below background.	

Table ES-1. Summary of Remedial Action Goals for the 100-D-50:1 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	All individual COPC concentrations in soil are below the groundwater and/or Columbia River protection criteria, with the exception of bis(2-ethylhexyl)phthalate in confirmatory samples. The presence of this analyte is likely due to cross-contamination by sampling equipment. Regardless, RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) predicts that this constituent would not migrate to groundwater. In pipe sediment and pipe scabble samples, residual concentrations of multiple metals, 4,4'-DDT, polycyclic aromatic hydrocarbons, and aroclor-1260 are above soil RAGs for groundwater and/or river protection. However, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), these constituents will not reach groundwater (and, therefore, the Columbia River) within 1,000 years [d], with the exception of antimony and arsenic at Service Area 4. Antimony and arsenic are present in the pipeline sediment at concentrations exceeding soil RAGs for groundwater and river protection. However, Ecology and DOE-RL have agreed that these exceedances do not warrant remediation of the 100-D-50:1 pipeline. Therefore, the residual concentrations achieve the RAOs for groundwater and river protection.	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).
[d] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of multiple metals, 4,4'-DDT, polycyclic aromatic hydrocarbons, and aroclor-1260 are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the constituent with the lowest distribution coefficient of 22 mL/g for copper). The vadose zone underlying the pipelines and Service Area 2 excavation is a minimum of 14.0 m (46 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

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

In accordance with this evaluation, the confirmatory and verification sampling results support a reclassification of this subsite to Interim Closed Out. The current site conditions achieve the RAOs and the corresponding RAGs of the RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-50:1 pipeline exists at a depth greater than 4.6 m (15 ft) bgs. The acceptability of direct contact with residual deep zone contamination has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are 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-50:1 subsite contaminants of potential concern and other constituents (Appendix A). The highest maximum or statistical value from the shallow zone decision units sampled for verification data purposes (overburden and staging pile areas) were considered for comparison. All other confirmatory and verification samples results are from areas more than 4.6 m (15 ft) bgs. Per *Washington Administrative Code* (WAC) 173-340-7490(4)(b) (Ecology 2001), soil concentrations deeper than the standard point of compliance of 4.6 m (15 ft) are not considered in evaluation of risk to ecological receptors. Ecological screening levels from WAC 173-340 were exceeded for boron and vanadium. The U.S. Environmental Protection Agency's ecological soil screening levels were exceeded for antimony, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, vanadium, and zinc are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), 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-50:1 EMERGENCY DISCHARGE PIPELINE

STATEMENT OF PROTECTIVENESS

The 100-D-50:1 Emergency Discharge Pipeline confirmatory and verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-50:1 pipelines exist at a depth greater than 4.6 m (15 ft) below ground surface (bgs). The acceptability of direct contact with residual deep zone contamination has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are 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-50:1 subsite contaminants of potential concern (COPCs) and other constituents (Appendix A). The highest maximum or statistical value from the shallow zone decision units sampled for verification data purposes (overburden and staging pile areas [SPAs]) were considered for comparison. All other confirmatory and verification samples results are from areas more than 4.6 m (15 ft) bgs. Per *Washington Administrative Code* (WAC) 173-340-7490(4)(b) (Ecology 2001), soil concentrations deeper than the standard point of compliance of 4.6 m (15 ft) are not considered in evaluation of risk to ecological receptors. Ecological screening levels from WAC 173-340 were exceeded for boron and vanadium. The U.S. Environmental Protection Agency's (EPA's) ecological soil screening levels were exceeded for antimony, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, vanadium, and zinc are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), 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-50 site, part of the 100-DR-1 Operable Unit, encompasses underground pipelines associated with pre-105-DR Reactor process cooling water, process wastewater, and sanitary wastewater. This site was administratively divided into 10 subsites based on process knowledge, COPCs, and possible remedial actions. The 100-D-50:1 subsite encompasses the process and storm sewer collection main for the southern portion of the 100-D/DR Area. This sewer was also intended to serve as an emergency discharge pipeline for the 105-DR Reactor, and radionuclide detections in confirmatory samples demonstrate that the pipeline was used for radioactive effluent discharges in some capacity. The exact nature, frequency, or volume of these discharges is unknown.

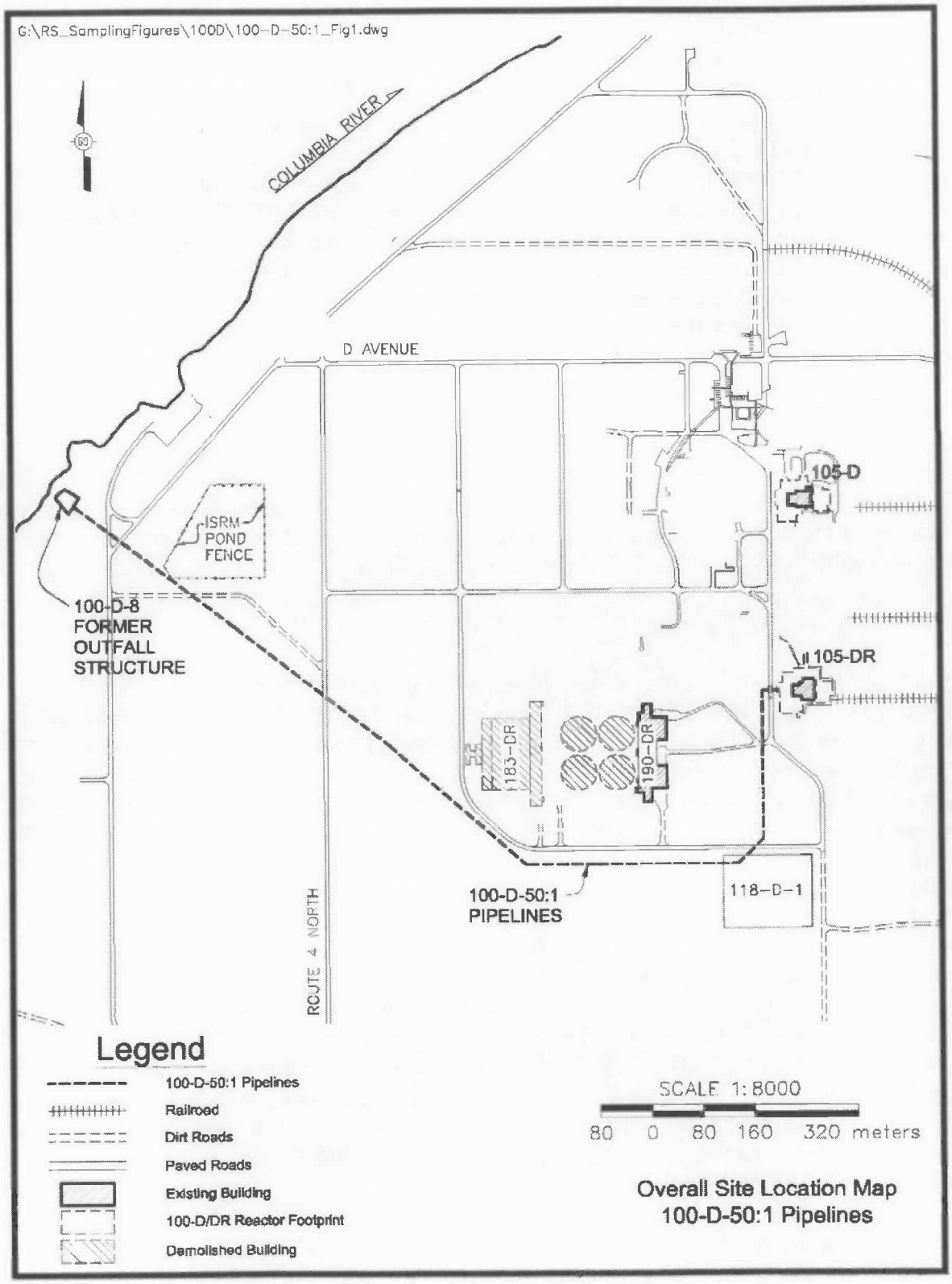
The 100-D-50:1 pipeline includes approximately 1,550 m (5,100 ft) of reinforced concrete pipeline. The line begins as a 1.07-m (42-in.) pipeline at the 105-DR Reactor Building footprint; transitions to a 1.37-m (54-in.) line upstream from the 183-DR clearwell process sewer (100-D-50:6 subsite) influent at manhole (MH) T-2a; transitions to a 1.83-m (72-in.) line upstream from the 183-DR sedimentation basin process sewer (100-D-50:5 subsite) influent at MH T-3; and ultimately ends at a former headwall outfall (100-D-8 waste site) (Figure 1). The 100-D-50:1 pipeline was completed to the outfall in 1949, with subsequent modifications to improve discharge capacity performed in 1950. Operational use of the system ceased between 1965 and 1968. The outfall structure was demolished in 1978. The 100-D-8, 105-DR Process Sewer Outfall Site was remediated in 2011, and the waste site was reclassified to Interim Closed Out on August 2, 2012 (WCH 2012c). No further decommissioning/abandonment activities are known to have been performed for the pipeline.

In addition to servicing the 105-DR Reactor Building, the 100-D-50:1 pipeline received discharges from the process and storm sewers associated with the 100-DR water treatment facilities (addressed as the 100-D-50:5 and 100-D-50:6 subsites). These facilities used physical and chemical treatment to condition raw water for reactor use. Chemical addition included sulfuric acid, lime, chlorine, commercial coagulants containing primarily ferrous sulfate or alum, sodium silicate, and sodium dichromate. Discharges to the process sewers presumably consisted primarily of stormwater runoff, backwash water, and underflow drainage from the water treatment units. However, discharges of concentrated chemical products to these sewers likely also occurred.

CONFIRMATORY SAMPLING ACTIVITIES

Confirmatory sampling at the 100-D-50:1 subsite was performed from December 2005 to January 2006, and again in April 2006, to collect data to support a determination if remedial action would be required at the subsite. The following subsections provide additional discussion of the information used to develop the confirmatory sampling design and evaluation of the analytical results.

Figure 1. Location of the 100-D-50:1 Pipeline Waste Site.



Contaminants of Potential Concern

The COPCs for the 100-D-50:1 subsite confirmatory sampling were identified based on existing historical information and possible past use of the site. The COPC list identified in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005) included cobalt-60, cesium-137, europium-152, europium-154, strontium-90, lead, hexavalent chromium, and metals. Europium-155, americium-241, carbon-14, tritium, nickel-63, plutonium-238, plutonium-239/240, technetium-99, uranium-234, uranium-235, and uranium-238 were also included as COPCs based on the possible use of the pipeline and the COPCs identified for the pipeline discharge point (100-D-8 outfall). To accommodate the possibility of discharges of atypical wastes to the 100-D-50:1 pipeline from the 105-DR Reactor Building, semivolatile organic compounds (SVOCs) were also included as site COPCs. Finally, polychlorinated biphenyls (PCBs) were included as COPCs, due to the potential presence of rubber gaskets and other PCB-containing materials in the facilities serviced by the pipeline.

While not considered COPCs, the potential presence of volatile organic compounds was evaluated by field screening with an organic vapor monitor during confirmatory sampling activities. No volatile organic compounds were detected at the 100-D-50:1 pipeline or underlying soil, and no further laboratory analysis was performed. Also, pesticide and herbicide analyses were inadvertently requested for some samples. The results of these analyses were considered with the associated confirmatory sampling results.

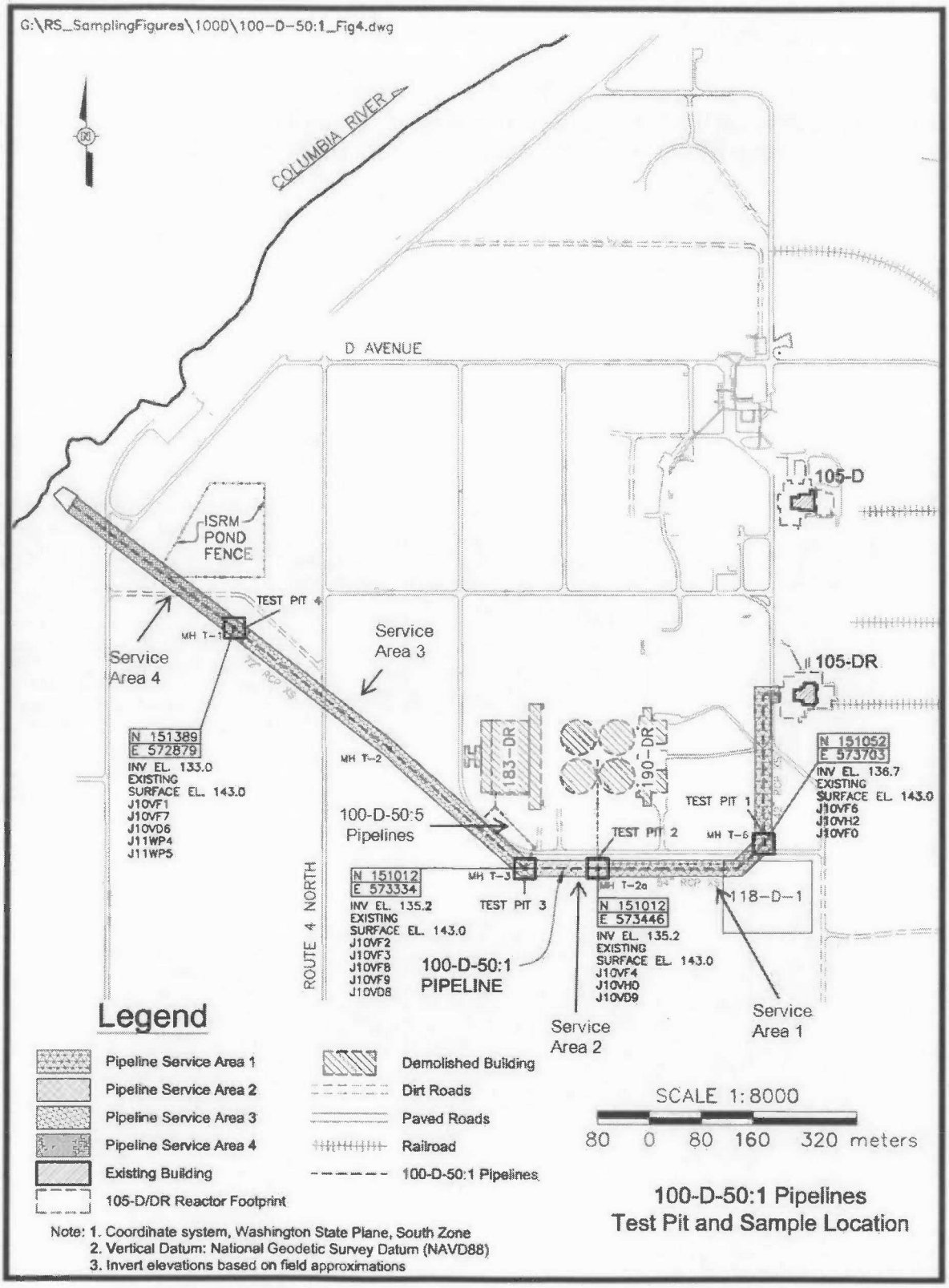
Confirmatory Sample Design

Historical design drawings, process knowledge, and site visit observations were used to develop a site-specific sample design for the 100-D-50:1 subsite. The subsite was divided into four service areas, shown in Figure 2, based on the direction of historic waste flows, pipeline length, and the potential impact of tributary influents on the former waste streams. Per the sampling design (WCH 2005c), test pits were excavated at manholes within each service area. During design of the test pits, it was determined that one planned excavation (at MH T-2) could not be completed due to the presence of an energized overhead power line. Therefore, in discussion with the Washington State Department of Ecology (Ecology), this location was removed from the confirmatory sampling design.

Confirmatory Sample Collection

Confirmatory sampling was performed in accordance with the confirmatory sampling plan (WCH 2005c) and the SAP (DOE-RL 2005). Samples were collected from sediments within the manhole structures, with the exception of MH T-6 (test pit 1), and from soils underlying the pipeline at the influent or effluent from the manhole structure. No sediment was found within MH T-6 or the proximate pipeline, but an area of elevated radiological activity was detected at the concrete sidewall of the pipeline immediately north (upstream) of the manhole structure by field instrumentation. The material displaying elevated radiological activity was scabbled and sampled. No radiological activity was detected above background by field screening at the other sampling locations.

Figure 2. Service Areas and Confirmatory Sampling Locations for the 100-D-50:1 Pipeline.



Following analysis of the confirmatory samples and partial backfill of site excavations, it was determined that the hexavalent chromium results in sediment from test pits 2, 3, and 4 should be rejected for decision-making purposes based on sample matrix interference as discussed in data quality analysis (Appendix D). This issue did not affect the other analyses associated with the confirmatory samples. The short holding time requirement for hexavalent chromium analysis in other solid samples precluded the possibility of reanalysis, and backfill operations had been partially completed at test pits 2 and 3. However, manhole sediments in test pit 4 remained accessible, and an additional sample and duplicate were collected and submitted for hexavalent chromium analysis.

A summary of the samples collected is presented in Table 1, and test pit locations are shown in Figure 2. Photographs of a manhole during field activities are provided in Figures 3 and 4.

Table 1. Confirmatory Sample Summary for the 100-D-50:1 Waste Site. (2 Pages)

Sample Location	Sample Media	Sample Number	WSP Sample Coordinates (Field Estimate)	Estimated Depth bgs m (ft)	Estimated Lateral Dimensions of Sample Area	Sample Analysis
Test pit 1 (MH T-6)	Pipe scabble	J10VF6	N 151052 E 573703	6.3 m (21 ft)	0.7 m by 1 m (2 ft by 3 ft)	ICP metals, mercury, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, total beta radiostrontium [a], PCB, SVOA, and pesticides
		J10VH2				Hexavalent chromium
	Soil underlying manhole and pipeline	J10VF0		6.3 m (21 ft)	0.7 m by 1 m (2 ft by 3 ft)	ICP metals, mercury, hexavalent chromium, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, and pesticides
Test pit 2 (MH T-2a) [b]	Pipe sediment	J10VF4	N 151012 E 573446	7.8 m (26 ft)	NA	ICP metals, mercury, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, herbicides, and pesticides
		J10VH0 [c]				Hexavalent chromium
	Soil underlying manhole and pipeline	J10VD9		7.8 m (26 ft)	0.7 m by 1 m (2 ft by 3 ft)	ICP metals, mercury, hexavalent chromium, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, and pesticides
Test pit 3 (MH T-3)	Pipe sediment	J10VF2	N 151012 E 573334	7.8 m (26 ft)	NA	ICP metals, mercury, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, herbicides, and pesticides
		J10VF8 [c]				Hexavalent chromium
	Pipe sediment (duplicate)	J10VF3				ICP metals, mercury, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, herbicides, and pesticides
		J10VF9 [c]				Hexavalent chromium

Table 1. Confirmatory Sample Summary for the 100-D-50:1 Waste Site. (2 Pages)

Sample Location	Sample Media	Sample Number	WSP Sample Coordinates (Field Estimate)	Estimated Depth bgs m (ft)	Estimated Lateral Dimensions of Sample Area	Sample Analysis
Test pit 3 (MH T-3)	Soil underlying manhole and pipeline	J10VD8	N 151012 E 573334	7.8 m (26 ft)	0.7 m by 1 m (2 ft by 3 ft)	ICP metals, mercury, hexavalent chromium, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, and pesticides
Test pit 4 (MH T-1)	Pipe sediment	J10VF1	N 151389 E 572879	10 m (33 ft)	NA	ICP metals, mercury, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, PCB, SVOA, herbicides, and pesticides
		J10VF7[c]				Hexavalent chromium
	Pipe sediment (resample)	J11WP4				Hexavalent chromium
	Pipe sediment (resample, duplicate)	J11WP5				Hexavalent chromium
	Soil underlying manhole and pipeline	J10VD6		10 m (33 ft)	0.7 m by 1 m (2 ft by 3 ft)	ICP metals, mercury, hexavalent chromium, GEA, gross alpha, gross beta, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, total beta radiostrontium[a], PCB, SVOA, and chlorinated pesticide
Equipment blank	Silica sand	J10VD7	NA	NA	NA	ICP metals, mercury, and SVOA
	Silica sand (resample)	J11WP3	NA	NA	NA	Hexavalent chromium

Source: *Remaining Sites Field Sampling*, Logbooks EL-1578-7, 8, and 9 (WCH 2005a, 2005b, 2006c, 2006d).

[a] Radiostrontium-specific analysis was performed after detecting gross beta activity elevated above background levels.

[b] Test pit 2 samples represent Service Area 2 of the 100-D-50:1 pipeline. Service Area 2 was the only portion of the 100-D-50:1 subsite to be subsequently remediated.

[c] Hexavalent chromium data from pipe sediment samples J10VF7, J10VF8, J10VF9 and J10VH0 in Test Pits 2, 3, and 4 were rejected due to data quality issues. Further discussion can be found in the data quality analysis (Appendix D). Re-collection of hexavalent chromium samples was performed at Test Pit 4. Test pits 2 and 3 were not accessible for sample recollection.

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
MH = manhole
NA = not applicable
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
WSP = Washington State Plane coordinates (m)

Figure 3. 100-D-50:1 Manhole Access Following Partial Demolition of the Manhole Structure.

Figure 4. 100-D-50:1 Manhole and Pipeline Exterior Following Excavation.

Confirmatory Sample Results

Test pit excavation and confirmatory sampling of the 100-D-50:1 subsite was performed from December 2005 to January 2006, with additional samples collected on April 12, 2006. Samples were analyzed using analytical methods approved by EPA as required by the SAP (DOE-RL 2005). Comparisons of the maximum concentrations of detected COPCs in Service Areas 1, 2, 3, and 4 to the site remedial action goals (RAGs) are summarized in Tables 2 through 5. Contaminants that were not detected by laboratory analysis or that are not considered COPCs for reasons stated in the following text are excluded from these tables. Calculated cleanup levels are not presented in the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2012) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in these tables. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the 100-D-50:1 subsite, but are not considered in Tables 2, through 5 because these isotopes are not related to the operational history of the site. The laboratory-reported results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to being provided to the Hanford Environmental Information System (HEIS) and are included as Attachment 2 of the *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations* in Appendix B.

Confirmatory Sampling Data Evaluation

Evaluation of Data for Direct Exposure

The 100-D-50:1 pipeline exists entirely within the deep zone (greater than 4.6 m [15 ft] bgs) and, therefore, is not considered within the direct exposure scenario. The only RAGs are soil cleanup levels for groundwater and river protection.

Protection of Groundwater and the Columbia River – Radionuclide

During confirmatory sampling, residual radionuclide activities in excess of soil lookup values for protection of groundwater and the Columbia River were detected in the concrete pipe scabble sample collected from Service Area 1 (Table 6). Therefore, site-specific modeling using RESidual RADioactivity (RESRAD) version 6.3 was performed (Appendix B) (WCH 2012a). The site-specific model indicates that residual radionuclides measured in confirmatory samples will not migrate to groundwater within 1,000 years; residual activity levels are, therefore, protective of groundwater. The only pathway for contamination to reach the Columbia River is via groundwater migration, so these activity levels are also protective of river water.

Table 2. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 1). (2 Pages)

COPC	Maximum Pipe Scabble Result (pCi/g)	Maximum Underlying Soil Result (pCi/g)	Soil Lookup Values [a] (pCi/g)		Does the Maximum Pipe Scabble Result Exceed Lookup Values?	Does the Maximum Underlying Soil Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
			Groundwater Protection Lookup Value	River Protection Lookup Value			
Carbon-14	11.4	200	-- [b]	-- [b]	No	No	--
Cesium-137	60.6	U	1,465	2,930	No	No	--
Cobalt-60	4.55	U	13,900	27,800	No	No	--
Europium-152	9.66	U	-- [b]	-- [b]	No	No	--
Nickel-63	39.4	U	83	166	No	No	--
Strontium-90 [c]	79.5	ND	27.6	55.2	Yes	--	Yes [d]
Uranium-233/234	0.407 (<BG)	0.446 (<BG)	1.1 [e]	1.1 [e]	No	No	--
Uranium-238	0.494 (<BG)	0.539 (<BG)	1.1 [e]	1.1	No	No	--
COPC	**Maximum Pipe Scabble Result (mg/kg)**	**Maximum Underlying Soil Result (mg/kg)**	**Soil Cleanup Levels [a] (mg/kg)**		**Does the Maximum Pipe Scabble Result Exceed RAGs?**	**Does the Maximum Underlying Soil Result Exceed RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
			Soil Cleanup Level for Groundwater Protection	**Soil Cleanup Level for River Protection**			
Antimony [f]	1.8 (<BG)	U	5 [e]	5 [e]	No	No	--
Arsenic	7.4	2.0 (<BG)	20 [e]	20 [e]	No	No	--
Barium	63.5 (<BG)	58.0 (<BG)	200	400	No	No	--
Beryllium	0.55 (<BG)	0.21 (<BG)	1.51 [e]	1.51 [e]	No	No	--
Boron [g]	3.6	0.69	320	-- [h]	No	No	--
Cadmium [f]	0.83	U	0.81 [e]	0.81 [e]	Yes	No	Yes [i]
Chromium (total)	66.6	8.5 (<BG)	18.5 [e]	18.5 [e]	Yes	No	Yes [i]
Cobalt	7.4 (<BG)	6.8 (<BG)	15.7 [e]	-- [h]	No	No	--
Copper	123	14.6 (<BG)	59.2	22.0 [e]	Yes	No	Yes [i]
Lead	233	2.9 (<BG)	10.2 [e]	10.2 [e]	Yes	No	Yes [i]
Manganese	306 (<BG)	279 (<BG)	512 [e]	512 [e]	No	No	--
Mercury	6.7	U	0.33 [e]	0.33 [e]	Yes	No	Yes [i]
Molybdenum [g]	2.3	U	8	-- [h]	No	No	--
Nickel	39.4	10.0 (<BG)	19.1 [e]	27.4	Yes	No	Yes [i]
Selenium [f]	0.64 (<BG)	U	5	1	No	No	--
Silver	0.49 (<BG)	U	8	0.73 [e]	No	No	--
Vanadium	31.7 (<BG)	43.3 (<BG)	85.1 [e]	-- [h]	No	No	--
Zinc	75.7	37.5 (<BG)	480	67.8 [e]	Yes	No	Yes [i]
Aroclor-1260	0.042	U	0.017 [j]	0.017 [j]	Yes	–	Yes [i]
Bis(2-ethylhexyl) phthalate	U	0.97	0.6	0.36	No	Yes	Yes [i, k]
Di-n-butylphthalate	0.051	U	160	540	No	No	--
Fluoranthene	0.034	U	64	18	No	No	--
Phenanthrene [l]	0.023	U	240	1,920	No	No	--

Table 2. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 1). (2 Pages)

COPC	Maximum Pipe Scabble Result (mg/kg)	Maximum Underlying Soil Result (mg/kg)	Soil Cleanup Levels [a] (mg/kg)		Does the Maximum Pipe Scabble Result Exceed RAGs?	Does the Maximum Underlying Soil Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Pyrene	0.022	U	48	192	No	No	--

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

[b] No value; because the K_d value for this contaminant is 200 mL/g, RESRAD modeling discussed in Appendix C of the 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.

[c] Due to elevated gross beta results on the pipe scabble sample, analysis for strontium-90 was conducted. Strontium-90 analysis was not conducted on the underlying soil sample because the gross beta result was less than background (23 pCi/g).

[d] Site-specific RESRAD evaluation (WCH 2012a) predicts that radionuclide COPCs will not reach groundwater (and, thus, the Columbia River) within 1,000 years.

[e] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).

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

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

[h] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

[i] RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) shows that residual concentrations of these constituents are not expected to migrate more than 3 m (9.8 ft) vertically in 1,000 years given the soil-partitioning coefficient (K_d) of 22 mL/g for copper, the contaminant with the lowest K_d value. The vadose zone underlying the soil below the site is approximately 14 m (46 ft) thick. Therefore, residual concentrations of cadmium, total chromium, copper, lead, mercury nickel, zinc, aroclor-1260, and bis(2-ethylhexyl)phthalate are predicted to be protective of groundwater and the Columbia River.

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

[k] Results for bis(2-ethylhexyl)phthalate are indicative of sample cross-contamination by sampling equipment and within the analytical laboratory environment rather than contamination in sediment or soil. Even if present at the site, bis(2-ethylhexyl)phthalate partitions strongly to soil (K_d = 110 mL/g), and will not migrate vertically within 1,000 years.

[l] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemical anthracene.

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
ND = no data
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*
U = undetected

Table 3. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 2). (2 Pages)

COPC	Maximum Pipe Sediment Result (pCi/g)	Maximum Underlying Soil Result (pCi/g)	Soil Lookup Values [a] (pCi/g)		Does the Maximum Pipe Sediment Result Exceed Lookup Values?	Does the Maximum Underlying Soil Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
			Groundwater Protection Lookup Value	River Protection Lookup Value			
Carbon-14	U	271	-- [b]	-- [b]	No	No	--
Cesium-137	1.28	U	1,465	2,930	No	No	--
Nickel-63	3.65	U	83	166	No	No	--
Uranium-233/234	0.203 (<BG)	0.534 (<BG)	1.1 [c]	1.1 [c]	No	No	--
Uranium-238	0.518 (<BG)	0.882 (<BG)	1.1 [c]	1.1 [c]	No	No	--
COPC	**Maximum Pipe Sediment Result (mg/kg)**	**Maximum Underlying Soil Result (mg/kg)**	**Soil Cleanup Levels [a] (mg/kg)**		**Does the Maximum Pipe Sediment Result Exceed RAGs?**	**Does the Maximum Underlying Soil Result Exceed RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
			Soil Cleanup Level for Groundwater Protection	**Soil Cleanup Level for River Protection**			
Antimony [d]	U	0.64 (<BG)	5 [c]	5 [c]	No	No	--
Arsenic	7.9	3.0 (<BG)	20 [c]	20 [c]	No	No	--
Barium	159	57.2 (<BG)	200	400	No	No	--
Beryllium	0.40 (<BG)	0.19 (<BG)	1.51 [c]	1.51 [c]	No	No	--
Boron [e]	8.8	0.36	320	-- [f]	No	No	--
Cadmium [d]	2.2	U	0.81 [c]	0.81 [c]	Yes	No	-- [g]
Chromium (total)	375	11.3 (<BG)	18.5 [c]	18.5 [c]	Yes	No	-- [g]
Cobalt	15.1 (<BG)	4.8 (<BG)	15.7 [c]	-- [f]	No	No	--
Copper	96.7	11.7 (<BG)	59.2	22.0 [c]	Yes	No	-- [g]
Lead	129	3.0 (<BG)	10.2 [c]	10.2 [c]	Yes	No	-- [g]
Manganese	1,030	248 (<BG)	512 [c]	512 [c]	Yes	No	-- [g]
Mercury	6.1	U	0.33 [c]	0.33 [c]	Yes	No	-- [g]
Nickel	37.8	10.5 (<BG)	19.1 [c]	27.4	Yes	No	-- [g]
Vanadium	54.8 (<BG)	25.1 (<BG)	85.1 [c]	-- [f]	No	No	--
Zinc	467	31.9 (<BG)	480	67.8 [c]	Yes	No	-- [g]
Aroclor-1260	0.15	U	0.017 [h]	0.017 [h]	Yes	No	-- [g]
4,4'-DDE	0.028	U	0.0257	0.005 [h]	Yes	No	-- [g]
4,4'-DDT	0.088	U	0.0257	0.005 [h]	Yes	No	-- [g]
Endosulfan I	0.011	U	9.6	0.0112	No	No	--
Endosulfan II	0.014	U	9.6	0.0112	Yes	No	-- [g]
Endrin aldehyde	0.041	U	0.2	0.039	Yes	No	-- [g]
Endrin ketone	0.077	U	0.2	0.039	Yes	No	-- [g]
Anthracene	4.7	U	240	1,920	No	No	--
Benzo(a)anthracene	34	U	0.33 [h]	0.33 [h]	Yes	No	-- [g]
Benzo(a)pyrene	32	U	0.33 [h]	0.33 [h]	Yes	No	-- [g]
Benzo(b)fluoranthene	38	U	0.33 [h]	0.33 [h]	Yes	No	-- [g]
Benzo(g,h,i)perylene [j]	19	U	48	192	No	No	--
Benzo(k)fluoranthene	25	U	0.33 [h]	0.33 [h]	Yes	No	-- [g]
bis(2-Ethylhexyl) phthalate	2.7 [i]	1.0 [i]	0.625	0.36	Yes	Yes	-- [g]
Carbazole	5.4	U	0.438	-- [k]	Yes	No	-- [g]
Chrysene	39	U	1.2 [q]	0.33 [h]	Yes	No	-- [g]
Di-n-butylphthalate	U	0.020	160	540	No	No	--
Dibenzo(a,h)anthracene	6.4	U	0.33 [h]	0.33 [h]	Yes	No	-- [g]

Table 3. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 2). (2 Pages)

COPC	Maximum Pipe Sediment Result (mg/kg)	Maximum Underlying Soil Result (mg/kg)	Soil Cleanup Levels [a] (mg/kg)		Does the Maximum Pipe Sediment Result Exceed RAGs?	Does the Maximum Underlying Soil Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Fluoranthene	73	U	64	18	Yes	No	-- [g]
Indeno(1,2,3-cd)pyrene	17	U	0.33[h]	0.33[h]	Yes	No	-- [g]
Phenanthrene [j]	26	U	240	1,920	No	No	--
Pyrene	47	U	48	192	No	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the RDR/RAWP (DOE-RL 2009b).
[b] No value; because the K_d value for this contaminant is 200 mL/g, RESRAD modeling discussed in Appendix C of the 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.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).
[d] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).
[g] The Service Area 2 pipeline segment has been remediated.
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[i] Results for bis(2-ethylhexyl)phthalate are indicative of sample cross-contamination by sampling equipment and within the analytical laboratory environment rather than contamination in sediment or soil.
[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals:
Contaminant: benzo(g,h,i)perylene; surrogate: pyrene
Contaminant: phenathrene; surrogate: anthracene

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
ND = no data
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*
U = undetected

Table 4. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 3). (2 Pages)

COPC	Maximum Pipe Sediment Result (pCi/g)	Maximum Underlying Soil Result (pCi/g)	Soil Lookup Values [a] (pCi/g)		Does the Maximum Pipe Sediment Result Exceed Lookup Values?	Does the Maximum Underlying Soil Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
			Groundwater Protection Lookup Value	River Protection Lookup Value			
Carbon-14	U	4,180	-- [b]	-- [b]	No	No	--
Cesium-137	1.92	U	1,465	2,930	No	No	--
Cobalt-60	0.167	U	13,900	27,800	No	No	--
Europium-152	0.607	U	-- [b]	-- [b]	No	No	--
Nickel-63	6.36	U	83	166	No	No	--
Uranium-233/234	0.498 (<BG)	0.504 (<BG)	1.1 [c]	1.1 [c]	No	No	--
Uranium-238	0.448 (<BG)	0.701 (<BG)	1.1 [c]	1.1 [c]	No	No	--
COPC	**Maximum Pipe Sediment Result (mg/kg)**	**Maximum Underlying Soil Result (mg/kg)**	**Soil Cleanup Levels [a] (mg/kg)**		**Does the Maximum Pipe Sediment Result Exceed RAGs?**	**Does the Maximum Pipe Sediment Result Pass RESRAD Modeling?**	**Does the Maximum Result Pass RESRAD Modeling?**
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Antimony [d]	3.5 (<BG)	0.54 (<BG)	5 [c]	5 [c]	No	No	--
Arsenic	7.0	3.2 (<BG)	20 [c]	20 [c]	No	No	--
Barium	116 (<BG)	69.7 (<BG)	200	400	No	No	--
Beryllium	0.27 (<BG)	0.25 (<BG)	1.51 [c]	1.51 [c]	No	No	--
Boron [e]	6.7	0.75	320	-- [f]	No	No	--
Cadmium [d]	1.4	0.12 (<BG)	0.81 [c]	0.81 [c]	Yes	No	Yes [g]
Chromium (total)	103	9.8 (<BG)	18.5 [c]	18.5 [c]	Yes	No	Yes [g]
Chromium (hexavalent) [e]	ND	0.21	4.8	2	--	No	--
Cobalt	8.5 (<BG)	6.4 (<BG)	15.7 [c]	-- [f]	No	No	--
Copper	57.3	13.9 (<BG)	59.2	22.0 [c]	Yes	No	Yes [g]
Lead	57.6	3.9 (<BG)	10.2 [c]	10.2 [c]	Yes	No	Yes [g]
Manganese	450 (<BG)	285 (<BG)	512 [c]	512 [c]	No	No	--
Mercury	3.1	U	0.33 [c]	0.33 [c]	Yes	No	Yes [g]
Nickel	22.5	10.3 (<BG)	19.1 [c]	27.4	Yes	No	Yes [g]
Vanadium	37.6 (<BG)	36.4 (<BG)	85.1 [c]	-- [f]	No	No	--
Zinc	270	35.3 (<BG)	480	67.8 [c]	Yes	No	Yes [g]
Aroclor-1260	0.073	U	0.017 [h]	0.017 [h]	Yes	No	Yes [g]
4,4'-DDT	0.022	U	0.0257	0.0033 [h]	Yes	No	Yes [g]
Endrin aldehyde	0.017	U	0.2	0.039	No	No	--
Anthracene	0.25	U	240	1,920	No	No	--
Benzo(a)anthracene	2.7	U	0.33 [h]	0.33 [h]	Yes	No	Yes [g]
Benzo(a)pyrene	3.0	U	0.33 [h]	0.33 [h]	Yes	No	Yes [g]
Benzo(b)fluoranthene	2.8	U	0.33 [h]	0.33 [h]	Yes	No	Yes [g]
Benzo(g,h,i)perylene [i]	1.8	U	48	192	No	No	--
Benzo(k)fluoranthene	2.5	U	0.33 [h]	0.33 [h]	Yes	No	Yes [g]
Bis(2-ethylhexyl) phthalate	1.5	1.5	0.6	0.36	Yes	Yes	Yes [g,j]
Chrysene	3.2	U	0.12	0.1 [h]	Yes	No	Yes [g]
Fluoranthene	4.4	U	64	18	No	No	--

Table 4. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 3). (2 Pages)

COPC	Maximum Pipe Sediment Result (mg/kg)	Maximum Underlying Soil Result (mg/kg)	Soil Cleanup Levels [a] (mg/kg)		Does the Maximum Pipe Sediment Result Exceed RAGs?	Does the Maximum Pipe Sediment Result Pass RESRAD Modeling?	Does the Maximum Result Pass RESRAD Modeling?
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Indeno(1,2,3-cd)pyrene	1.7	U	0.33 [h]	0.33 [h]	Yes	No	Yes [g]
Phenanthrene [i]	0.85	U	240	1,920	No	No	--
Pyrene	3.3	U	48	192	No	No	--

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

[b] No value; because the K_d value for this contaminant is 200 mL/g, RESRAD modeling discussed in Appendix C of the 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.

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).

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

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

[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

[g] RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) shows that residual concentrations of these constituents are not expected to migrate more than 3 m (9.8 ft) vertically in 1,000 years given the soil-partitioning coefficient (K_d) of 22 mL/g for copper, the contaminant with the lowest K_d value. The vadose zone underlying the soil below the site is approximately 14 m (46 ft) thick. Therefore, residual concentrations of cadmium, total chromium, copper, lead, mercury nickel, zinc, aroclor-1260, 4,4'-DDT, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl) phthalate, chrysene, and indeno(1,2,3-cd)pyrene 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) (Ecology 1996). The RDLs presented for PAH reflect limits associated with the SW-846 Method 8270, not the limits associated with PAH-specific SW-846 method 8310.

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

[j] Results for bis(2-ethylhexyl)phthalate are indicative of sample cross-contamination by sampling equipment and within the analytical laboratory environment rather than contamination in sediment or soil. Even if present at the site, bis(2-ethylhexyl)phthalate partitions strongly to soil (K_d = 110 mL/g) and will not migrate vertically in 1,000 years.

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
ND = no data
PAH = polycyclic aromatic hydrocarbons
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*
U = undetected

Table 5. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 4). (2 Pages)

COPC	Maximum Pipe Sediment Result (pCi/g)	Maximum Underlying Soil Result (pCi/g)	Soil Lookup Values [a] (pCi/g)		Does the Maximum Pipe Sediment Result Exceed Lookup Values?	Does the Maximum Underlying Soil Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
			Groundwater Protection Lookup Value	River Protection Lookup Value			
Carbon-14	U	79.2	-- [b]	-- [b]	No	No	--
Strontium-90 [c]	ND	1.66	27.6	55.2	--	No	--
Uranium-233/234	0.194 (<BG)	0.595 (<BG)	1.1 [d]	1.1 [d]	No	No	--
Uranium-238	U	0.622 (<BG)	1.1 [d]	1.1 [d]	No	No	--
COPC	**Maximum Pipe Sediment Result (mg/kg)**	**Maximum Underlying Soil Result (mg/kg)**	**Soil Cleanup Levels [a] (mg/kg)**		**Does the Maximum Pipe Sediment Result Exceed RAGs?**	**Does the Maximum Underlying Soil Result Exceed RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Antimony [c]	22.6	U	5 [d]	5 [d]	Yes	No	Yes [f]
Arsenic	44.0	2.4 (<BG)	20 [d]	20 [d]	Yes	No	Yes [f]
Barium	58.7 (<BG)	85.3 (<BG)	200	400	No	No	--
Beryllium	0.12 (<BG)	0.33 (<BG)	1.51 [d]	1.51 [d]	No	No	--
Boron [g]	5.6	0.92	320	-- [h]	No	No	--
Cadmium [c]	U	0.13 (<BG)	0.81 [d]	0.81 [d]	No	No	--
Chromium (total)	251	6.8 (<BG)	18.5 [d]	18.5 [d]	Yes	No	Yes [i]
Cobalt	26.8	7.2 (<BG)	15.7 [d]	-- [j]	Yes	No	Yes [i]
Copper	990	14.0 (<BG)	59.2	22.0 [d]	Yes	No	Yes [i]
Lead	47.1	4.3 (<BG)	10.2 [d]	10.2 [d]	Yes	No	Yes [i]
Manganese	1610	335 (<BG)	512 [d]	512 [d]	Yes	No	Yes [i]
Mercury	1.2	U	0.33 [d]	0.33 [d]	Yes	No	Yes [i]
Molybdenum [g]	20.7	0.18	8	-- [j]	Yes	No	Yes [i]
Nickel	368	9.4 (<BG)	19.1 [d]	27.4	Yes	No	Yes [i]
Vanadium	21.5 (<BG)	37.2 (<BG)	85.1 [d]	-- [j]	No	No	--
Zinc	185	36.9 (<BG)	480	67.8 [d]	Yes	No	Yes [i]
Methoxychlor	0.0090	U	4	1.67	No	No	--

Table 5. Comparison of Maximum Detected Contaminant Concentrations to Action Levels for the 100-D-50:1 Confirmatory Samples (Service Area 4). (2 Pages)

COPC	Maximum Pipe Sediment Result (mg/kg)	Maximum Underlying Soil Result (mg/kg)	Soil Cleanup Levels [a] (mg/kg)		Does the Maximum Pipe Sediment Result Exceed RAGs?	Does the Maximum Underlying Soil Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
			Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection			
Bis(2-ethylhexyl) phthalate	0.84	0.91	0.6	0.36	Yes	Yes	Yes [h, i]

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

[b] No value; because the K_d value for this contaminant is 200 mL/g, RESRAD modeling discussed in Appendix C of the 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.

[c] Due to elevated gross beta results from the soil sample, analysis for strontium-90 was conducted. Strontium-90 analysis was not conducted on the pipe sediment sample because the gross beta result was less than background (23 pCi/g).

[d] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700[4][d] (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009b).

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

[f] Arsenic and antimony concentrations for Service Area 4 pipeline sediment cannot be demonstrated to be protective strictly using the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) due to the low K_d values associated with these constituents. Ecology and DOE-RL have agreed that the presence of these constituents in pipe scale at concentrations above soil RAGs does not present a risk that warrants remediation of the 100-D-50:1 pipeline. This scale is a corrosion product present on the inner pipeline surface that formed due to degradation of the metallic surface by electrochemical reactions. The scale commonly attracts and binds other inorganic constituents present in the water. Detailed discussion of corrosion scales associated with water distribution pipelines is provided in Inorganic Contaminant Accumulation in Potable Water Distribution Systems (EPA 2006).

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

[h] Results for bis(2-ethylhexyl)phthalate are indicative of sample cross-contamination by sampling equipment and within the analytical laboratory environment rather than contamination in sediment or soil. Even if present at the site, bis(2-ethylhexyl)phthalate partitions strongly to soil (K_d = 110 mL/g) and will not migrate vertically in 1,000 years.

[i] RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) shows that residual concentrations of these constituents are not expected to migrate more than 3 m (9.8 ft) vertically in 1,000 years given the soil-partitioning coefficient (K_d) of 22 mL/g for copper, the contaminant with the lowest K_d value. The vadose zone underlying the soil below the site is approximately 14 m (46 ft) thick. Therefore, residual concentrations of total chromium, cobalt, copper, lead, manganese, mercury molybdenum, nickel, zinc, and bis(2-ethylhexyl)phthalate are predicted to be protective of groundwater and the Columbia River.

[j] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COPC = contaminant of potential concern
K_d = distribution coefficient
ND = no data
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*
U = undetected

Table 6. Maximum Radionuclide Concentrations Results from 100-D-50:1 Confirmatory Sampling Input to RESRAD (WCH 2012a).

Radionuclide	Maximum Concentration (pCi/g)	Sample Location and Matrix
Carbon-14	4,180	Test pit 3, soil
Cesium-137	60.6	Test pit 1, pipe scabble
Cobalt-60	4.55	Test pit 1, pipe scabble
Europium-152	9.66	Test pit 1, pipe scabble
Nickel-63	39.4	Test pit 1, pipe scabble
Strontium-90	79.5	Test pit 1, pipe scabble

Residual radionuclide activities at all other service areas were significantly below lookup values for protection of groundwater and the Columbia River. No radionuclides were detected above background levels in underlying soil, with the exception of carbon-14. In general, the observed carbon-14 results are anomalous in that observed activities in underlying soil are significantly higher than activities measured within the pipeline sediments, and no other COPCs were detected at significant levels in soils underlying the pipeline. The maximum carbon-14 detection in soil (4,180 pCi/g in Service Area 3) was included in the RESRAD model (Table 6) and was confirmed to be protective of groundwater and the Columbia River.

Evaluation of Data for Protection of Groundwater and the Columbia River - Nonradionuclides

Residual concentrations of multiple metals, 4,4'-DDT, polycyclic aromatic hydrocarbons, and aroclor-1260 were detected above soil RAGs for groundwater and/or river protection in pipe sediment and/or scabble samples, as shown in Tables 2 through 5. However, based on the soil-partitioning coefficient (K_d) values for these constituents (all at least 22 mL/g) and RESRAD modeling provided in the RDR/RAWP (DOE-RL 2009b), it is predicted that these constituents will not reach groundwater at an elevation of 118.5 m (389 ft) within 1,000 years, with the exception of arsenic and antimony in Service Area 4 pipe sediment. Residual concentrations of these contaminants are, therefore, protective of groundwater (and thus the Columbia River).

Residual concentrations of antimony and arsenic in Service Area 4 pipe sediment cannot be demonstrated to be protective using RESRAD modeling and the K_d values provided in the RDR/RAWP (DOE-RL 2009b). However, residual concentrations of these metals are restricted to the interior of the pipeline and no vertical driving force is expected to reach the interior of the pipeline given that institutional controls to prevent unrestricted drilling/excavation into the pipeline will be in place. Further, the total mass of antimony and arsenic contamination at the 100-D-50:1 subsite is present within sparse sediment material in the pipeline and is therefore likely not present in a sufficient quantity to reasonably pose any risk to groundwater (or the Columbia River) within 1,000 years, thus achieving remedial action objectives.

100-D-50:1 Remediation Decisions

Following discussion of confirmatory sampling results with the U.S. Department of Energy, Richland Operations Office (DOE-RL) and Ecology, including consideration of relative risk presented by the 100-D-50:1 subsite, relative cost of remediation, and additional confirmatory sampling alternatives, Ecology recommended that the pipeline be remediated downgradient from MH T-2a. Ecology also recommended grout-stabilization of pipeline sediments as an alternative to remove, treat, and dispose for portions of the pipeline where remediation would impact the in situ redox manipulation barrier for hexavalent chromium in the groundwater.

The 183-DR clearwell pipelines (100-D-50:6 waste site) discharge directly into the 100-D-50:1 pipeline at MH T-2a (in Service Area 2) (Figure 5). Hexavalent chromium was detected above soil RAGs within the 100-D-50:6 pipelines during confirmatory sampling of that waste site (WCH 2006b). In further discussion, DOE-RL agreed to remediation of the 100-D-50:1 pipeline between MH T-2a and MH T-3 (in Service Area 2), as this area would have received the most concentrated discharges of hexavalent chromium-contaminated waste streams. Directly downstream of Service Area 2, the effluent in the 100-D-50:1 pipeline was diluted with influent from the 100-D-50:5 process sewers pipeline. Confirmatory sampling of the 100-D-50:5 pipeline demonstrated that the pipeline did not convey chromium contaminated effluent.

As discussed in the remove, treat, dispose (RTD) report (WCH 2008), Ecology also requested characterization of potential residual contamination at the 100-D-8 outfall as part of the closeout approach for the 100-D-50:1 pipeline. At the time of the 100-D-50:1 confirmatory sampling, the conditions at the 100-D-8 waste site precluded any meaningful confirmatory sampling to characterize residual contamination. The 100-D-8 outfall was recommended for remedial action in 2006 based on the results of field radiological surveys at the outfall and evidence of radiological discharge in the 100-D-50:1 pipeline from confirmatory sampling (WCH 2006a). Remediation of the 100-D-8 outfall was completed in October 2011, and the waste site was reclassified to Interim Closed Out on August 2, 2012 (WCH 2012c). Grab samples of pipe sediment and underlying soil (J1R3M4, J1R3M5, and J1R3M6) were collected at the downstream end of the 100-D-50:1 pipeline within the 100-D-8 excavated area on October 16, 2012, for information purposes only. Analytical sampling results are reported in Appendix C. All 100-D-50:1 verification sampling COPCs were included for analysis.

REMEDIAL ACTION SUMMARY

Remediation of Service Area 2 of the 100-D-50:1 emergency discharge pipeline was performed from February 14 through March 6, 2012. The excavation extended to a depth of 7.5 m (25 ft) bgs along the length of the pipeline. Approximately 17,000 bank cubic meters (22,000 bank cubic yards) of overburden material was placed in five stockpiles: one stockpile to the northeast of the excavation, one stockpile to the northwest of the excavation, and three stockpiles to the south of the excavation (Figure 6). Approximately 1,350 BCM (1,800 BCY) of potentially contaminated soil, concrete, and piping was excavated and stockpiled in one SPA east of the excavation and one SPA to the south of the excavation and later disposed at the Environmental Restoration Disposal Facility. No anomalous materials were encountered during the excavation.

Figure 5. Intersection of 100-D-50:1, 100-D-50:5, and 100-D-50:6 Pipelines.

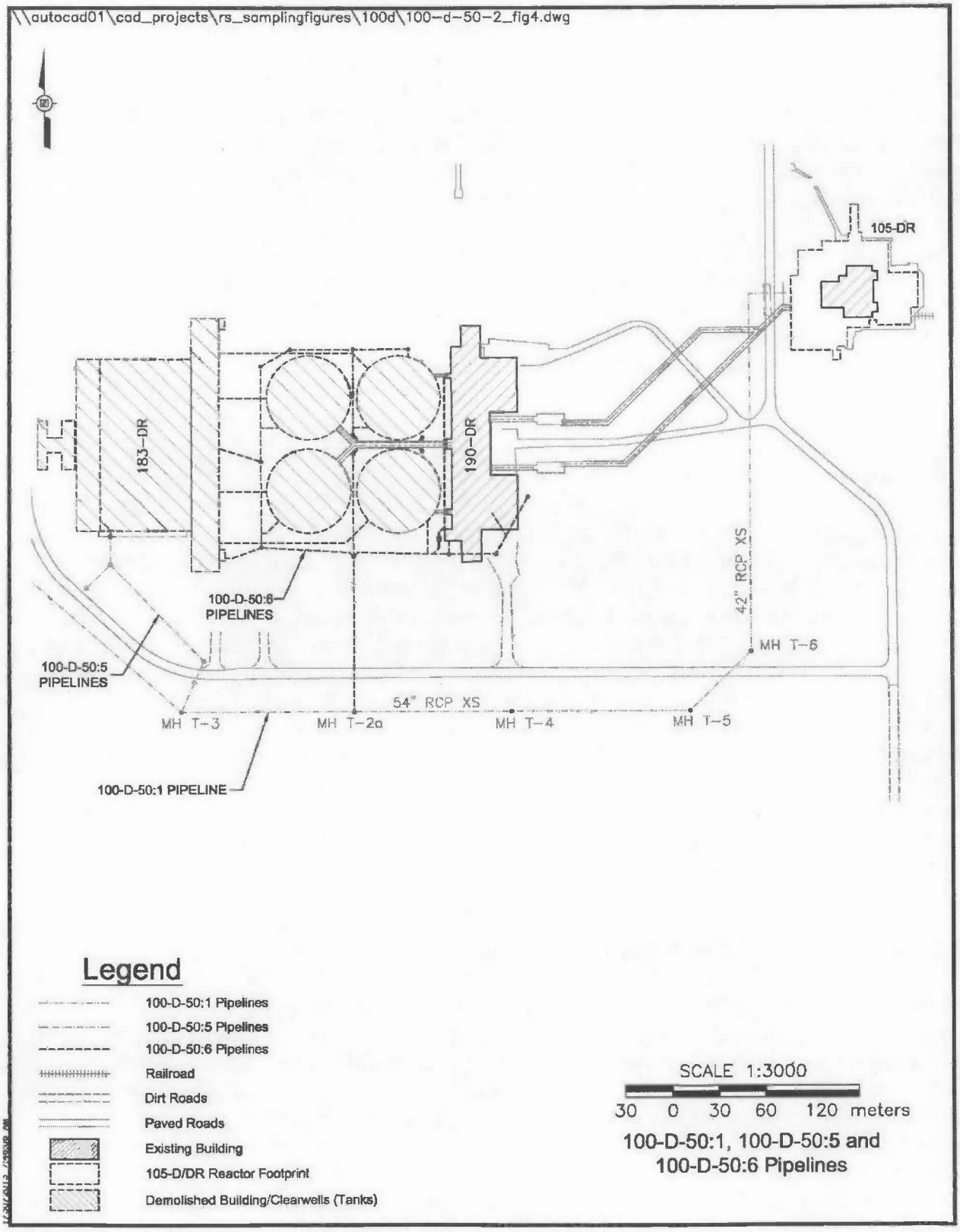
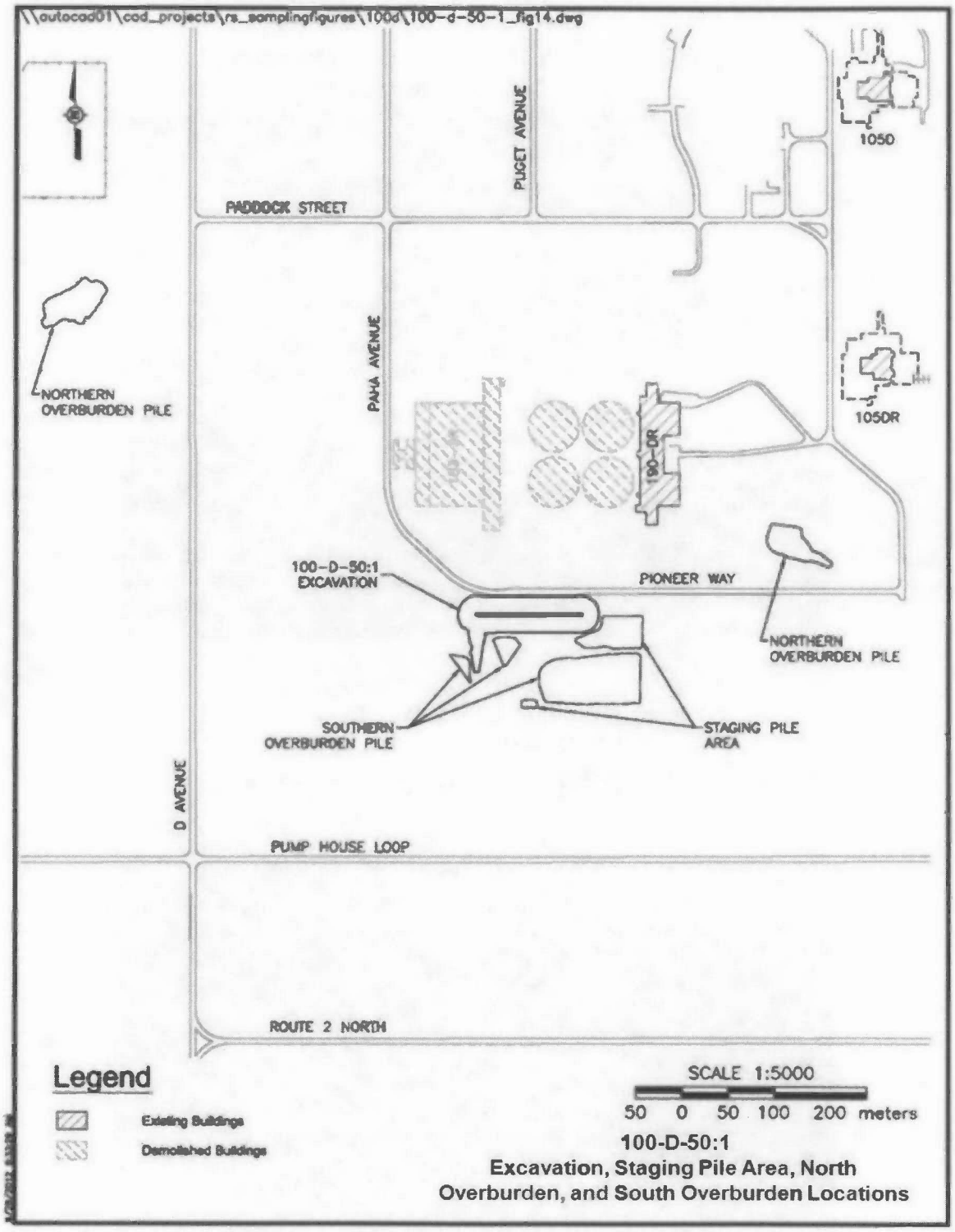


Figure 6. Locations of the 100-D-50:1 Service Area 2 Excavation, Staging Pile Areas, and Overburden Stockpiles

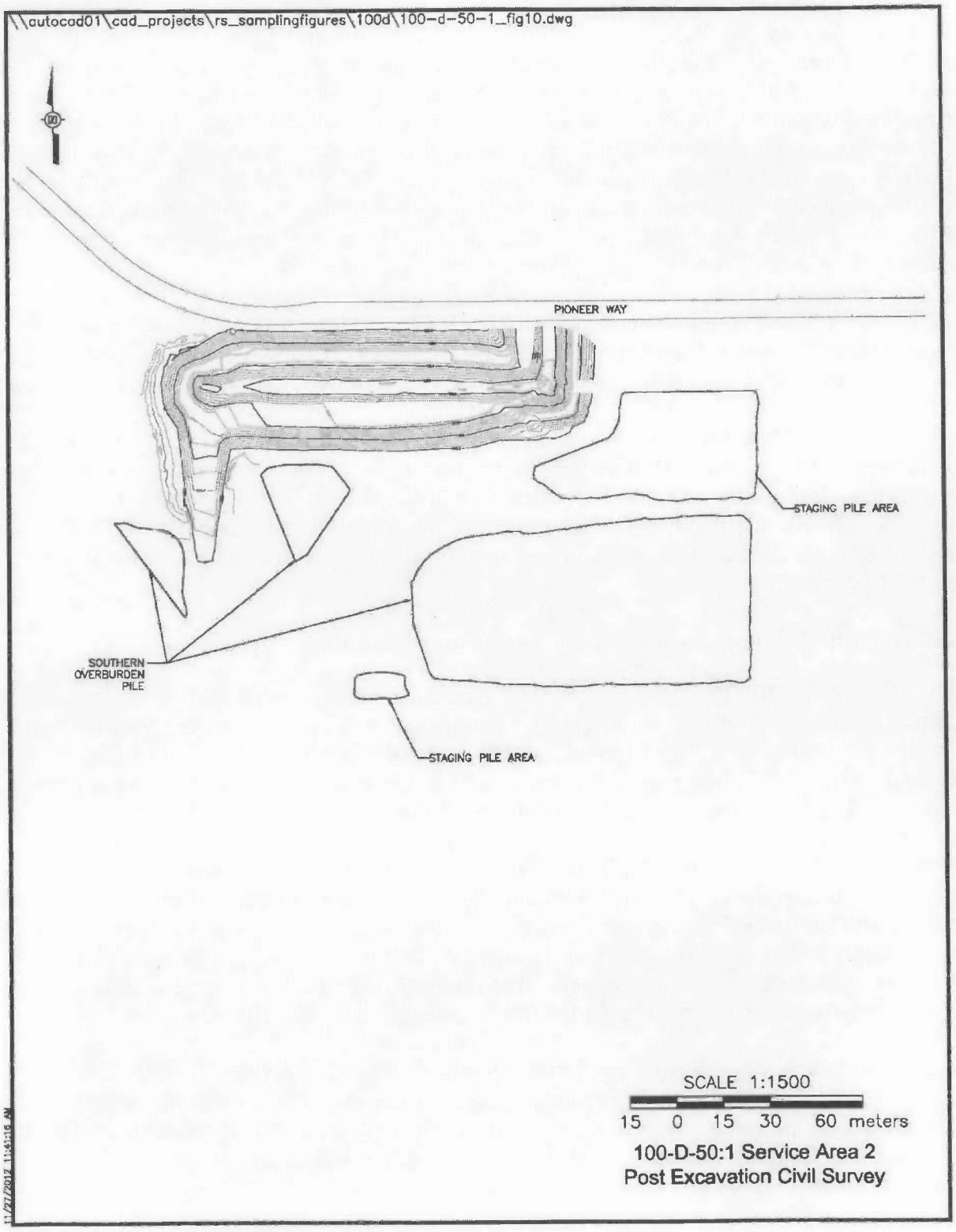


Photographs of the overburden removal and pipeline removal are presented in Figures 7 and 8. The post-excavation civil survey of Service Area 2 is provided in Figure 9.

Figure 7. Photograph of Overburden Removal at 100-D-50:1 Service Area 2.

Figure 8. Photograph of Pipe Removal at 100-D-50:1 Service Area 2.

Figure 9. Post-Excavation Civil Survey for 100-D-50:1 Service Area 2.



VERIFICATION SAMPLING ACTIVITIES

This section describes the basis for selection of a verification sampling design for the Service Area 2 remediation at the 100-D-50:1 subsite. Statistical sampling was the method chosen for selecting the sampling locations. The areas identified for the purpose of statistical verification sampling for the Service Area 2 remediation at 100-D-50:1 consists of four decision units, the excavated area, SPA, north overburden area (included two overburden piles), and south overburden area (included three overburden piles) (Figures 10, 11, and 12). A focused sample was also collected from the soil beneath the remaining 100-D-50:1 pipe at the west (downstream) end of the excavation area. There was no material within the remaining downstream pipe available for sampling.

Verification sampling at the 100-D-50:1 Service Area 2 remediation area was conducted on August 30 and September 4, 2012, to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). Grab samples were collected as described in revision 1 of the *Work Instruction for Verification Sampling of the 100-D-50:1 Emergency Discharge Pipelines* (WCH 2012d) in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the SAP (DOE-RL 2009a). The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the subsite.

Contaminants of Potential Concern for Verification Sampling

The COPCs for the 100-D-50:1 subsite Service Area 2 remediation were identified based on confirmatory sampling results (WCH 2008), existing historical information, and possible past use of the site. The COPC list identified in the RDR/RAWP (DOE-RL 2009b) included cobalt-60, cesium-137, europium-152, europium-154, strontium-90, lead, hexavalent chromium, and metals. Europium-155, carbon-14, nickel-63, uranium-234, uranium-235, uranium-238, pesticides, and SVOCs were included as COPCs based on the possibility of discharges of atypical wastes to the 100-D-50:1 pipeline from the 105-DR Reactor Building, the COPCs identified for the discharge point (100-D-8 outfall), and detections in the confirmatory sampling results. Polychlorinated biphenyls were also included as COPCs, due to the potential presence of rubber gaskets and other PCB-containing materials in the facilities serviced by the pipeline. Although not a COPC, tritium analysis was inadvertently requested and reported for all verification samples. The resulting tritium data is considered for site closeout.

The analytical methods performed to evaluate the site COPCs are provided in Table 7. Although not COPCs, aluminum, antimony, arsenic, barium, beryllium, calcium, chromium (total), cobalt, copper, iron, magnesium, manganese, molybdenum, nickel, potassium, selenium, silicon, silver, sodium, vanadium, and zinc were evaluated by requesting the expanded inductively coupled plasma (ICP) metals analytical list.

Figure 10. Verification Sample Locations of the 100-D-50:1 Subsite Excavation, Staging Pile Areas, and Southern Overburden.

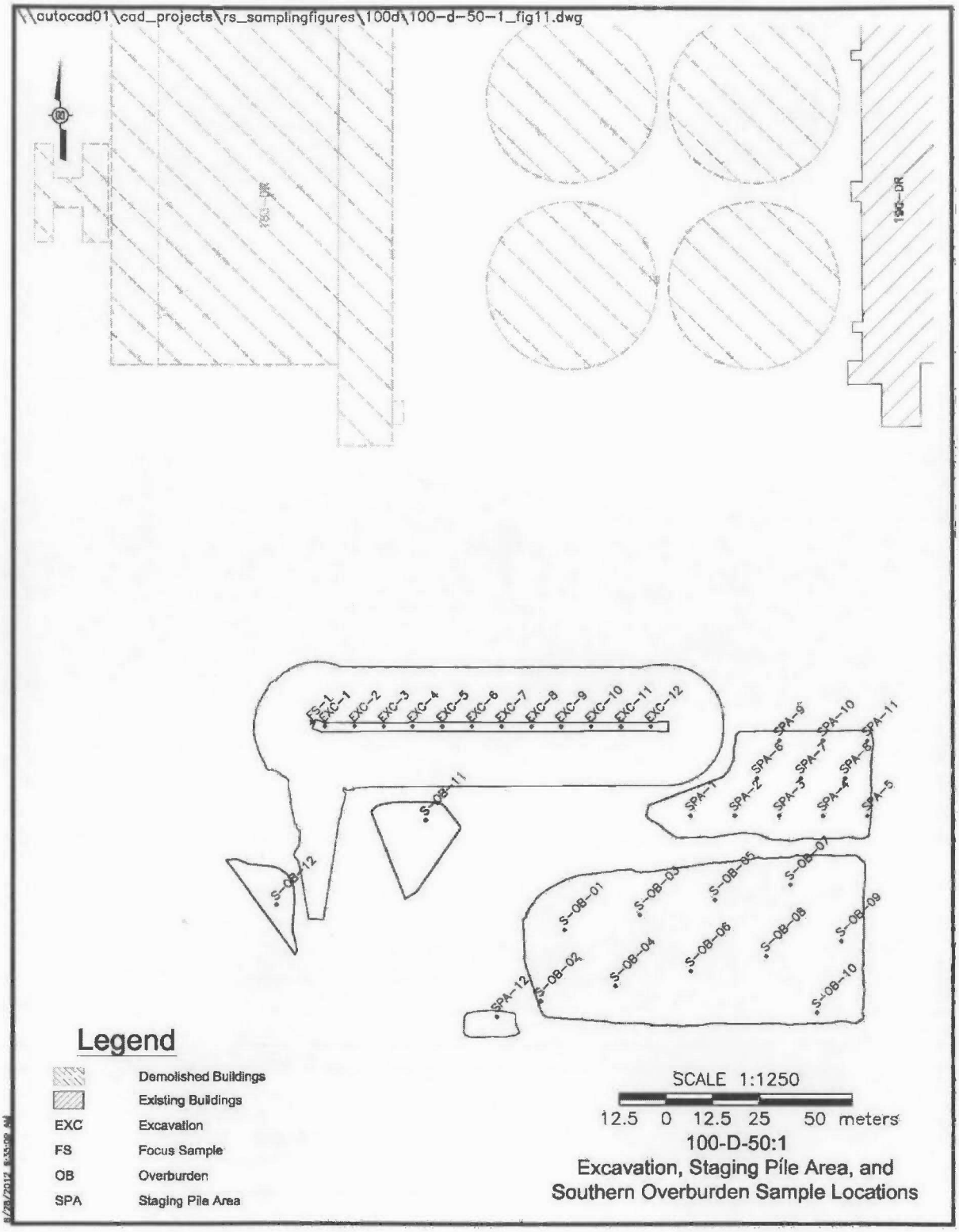


Figure 11. Locations of the North Overburden Samples N-OB-1 through N-OB-5.

Figure 12. Locations of the Northern Overburden Verification Samples N-OB-6 through N-OB-12.

Table 7. Laboratory Analytical Methods.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Lead
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
SVOA – EPA Method 8270	Semivolatile organic compounds
PCB – EPA Method 8082	Polychlorinated biphenyls
Pesticides – EPA Method 8081	Pesticides
GEA – Gamma spectroscopy	Cobalt-60, cesium-137, europium-152, europium-154, europium-155
Nickel-63 – Liquid scintillation	Nickel-63
Carbon-14 – Liquid scintillation	Carbon-14
Total radiostrontium	Strontium-90
Isotopic uranium	Uranium-233/234, uranium-235, uranium-238

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

COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Verification Sampling Design

The statistical sampling design for the 100-D-50:1 Service Area 2 remediation (WCH 2012d) was developed using Visual Sample Plan[1] (VSP). The areas identified for the purpose of statistical verification sampling were delineated in VSP and used as the basis for a random-start systematic grid for verification soil sample collection at the site. Twelve statistical soil samples were collected on the grid within each of the four decision units. A triangular grid is used based on studies that indicate triangular grids are superior to square grids (Gilbert 1987). The 100-D-50:1 Service Area 2 related sample locations are shown in Figures 10, 11, and 12. A focused sample was also collected from the soil beneath the remaining 100-D-50:1 pipe at the west (downstream) end of the excavation (Figure 10). A summary of the verification samples collected and laboratory analyses performed is provided in Table 8.

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

Table 8. 100-D-50:1 Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
EXC-1	J1R0T2	151012.5	573336.0	ICP metals [a], mercury, hexavalent chromium, SVOA, pesticides, PCB, nitrate/nitrite, anions, GEA, nickel-63, carbon-14, total radiostrontium, and isotopic uranium
EXC-2	J1R0T3	151012.5	573345.5	
EXC-3	J1R0T4	151012.5	573355.3	
EXC-4	J1R0T5	151012.5	573364.9	
EXC-5	J1R0T6	151012.5	573374.5	
EXC-6	J1R0T7	151012.5	573384.2	
EXC-7	J1R0T8	151012.5	573393.8	
EXC-8	J1R0T9	151012.5	573403.5	
EXC-9	J1R0V0	151012.5	573413.1	
EXC-10	J1R0V1	151012.5	573422.8	
EXC-11	J1R0V2	151012.5	573432.4	
EXC-12	J1R0V3	151012.5	573442.1	
Duplicate of EXC-9	J1R0V5	151012.5	573413.1	
FS-1 Soil beneath west pipe	J1R0V4	151013.7	573331.7	
SPA-1	J1R0V6	150983.1	573454.9	ICP metals [a], mercury, hexavalent chromium, SVOA, pesticides, PCB, nitrate/nitrite, anions, GEA, nickel-63, carbon-14, total radiostrontium, and isotopic uranium
SPA-2	J1R0V7	150983.1	573469.1	
SPA-3	J1R0V8	150983.1	573483.3	
SPA-4	J1R0V9	150983.1	573497.6	
SPA-5	J1R0W0	150983.1	573511.8	
SPA-6	J1R0W1	150995.5	573476.2	
SPA-7	J1R0W2	150995.5	573490.5	
SPA-8	J1R0W3	150995.5	573504.7	
SPA-9	J1R0W4	151007.8	573483.3	
SPA-10	J1R0W5	151007.8	573497.6	
SPA-11	J1R0W6	151007.8	573511.8	
SPA-12	J1R0W7	150916.8	573392.3	
Duplicate of SPA-7	J1R0W8	150995.5	573490.5	
N-OB-1	J1R0W9	151073.8	573686.0	ICP metals [a], mercury, hexavalent chromium, SVOA, pesticides, PCB, nitrate/nitrite, anions, GEA, nickel-63, carbon-14, total radiostrontium, and isotopic uranium
N-OB-2	J1R0X0	151073.8	573705.2	
N-OB-3	J1R0X1	151090.5	573657.1	
N-OB-4	J1R0X2	151090.5	573676.4	
N-OB-5	J1R0X3	151107.1	573666.7	
N-OB-6	J1R1P5	151340.3	572878.2	
N-OB-7	J1R0X5	151340.3	572897.4	
N-OB-8	J1R0X6	151357.0	572868.6	
N-OB-9	J1R0X7	151357.0	572887.8	
N-OB-10	J1R0X8	151357.0	572907.0	
N-OB-11	J1R0X9	151373.6	572897.4	
N-OB-12	J1R100	151373.6	572916.6	
Duplicate of N-OB-10	J1R101	151357.0	572907.0	

Table 8. 100-D-50:1 Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
S-OB-1	J1R102	150945.4	573414.2	ICP metals [a], mercury, hexavalent chromium, SVOA, pesticides, PCB, nitrate/nitrite, anions, GEA, nickel-63, carbon-14, total radiostrontium, and isotopic uranium
S-OB-2	J1R103	150921.9	573406.4	
S-OB-3	J1R104	150950.4	573438.5	
S-OB-4	J1R105	150926.9	573430.6	
S-OB-5	J1R106	150955.3	573462.8	
S-OB-6	J1R107	150931.8	573454.9	
S-OB-7	J1R108	150960.3	573487.0	
S-OB-8	J1R109	150936.8	573479.2	
S-OB-9	J1R110	150941.8	573503.8	
S-OB-10	J1R111	150918.6	573495.6	
S-OB 11	J1R112	150981.6	573369.2	
S-OB-12	J1R113	150953.6	573320.1	
Duplicate of S-OB-1	J1R114	150945.4	573414.2	
Equipment blank	J1R115	NA	NA	ICP metals [a], mercury, SVOA

Source: *Remaining Sites Field Sampling*, Logbook EL-1607-14 (WCH 2012b).

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

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
OB = overburden
PCB = polychlorinated biphenyl
SPA = staging pile area
SVOA = semivolatile organic analysis

Informational Sampling

As discussed in the 100-D-50:1 RTD report (WCH 2008), Ecology requested characterization of potential residual contamination at the 100-D-8 outfall as part of the closeout approach for the 100-D-50:1 pipeline. The 100-D-8 outfall was recommended for remedial action in 2006 based on the results of field radiological surveys at the outfall and evidence of radiological discharge in the 100-D-50:1 pipeline from confirmatory sampling (WCH 2006a). Remediation of the 100-D-8 outfall was completed in October 2011, and the waste site was reclassified to Interim Closed Out on August 2, 2012 (WCH 2012c). Grab samples of pipe sediment and underlying soil (J1R3M4, J1R3M5, and J1R3M6) were collected at the downstream end of the 100-D-50:1 pipeline within the 100-D-8 excavated area on October 16, 2012 (Figure 13) for information purposes only. The analytical results are reported in Appendix C. All 100-D-50:1 verification sampling COPCs were included for analysis. Minimal sediment material was available in the pipe as shown in Figure 14.

Figure 13. 100-D-50:1 Pipeline Terminus Location at 100-D-8 Outfall Remediation.

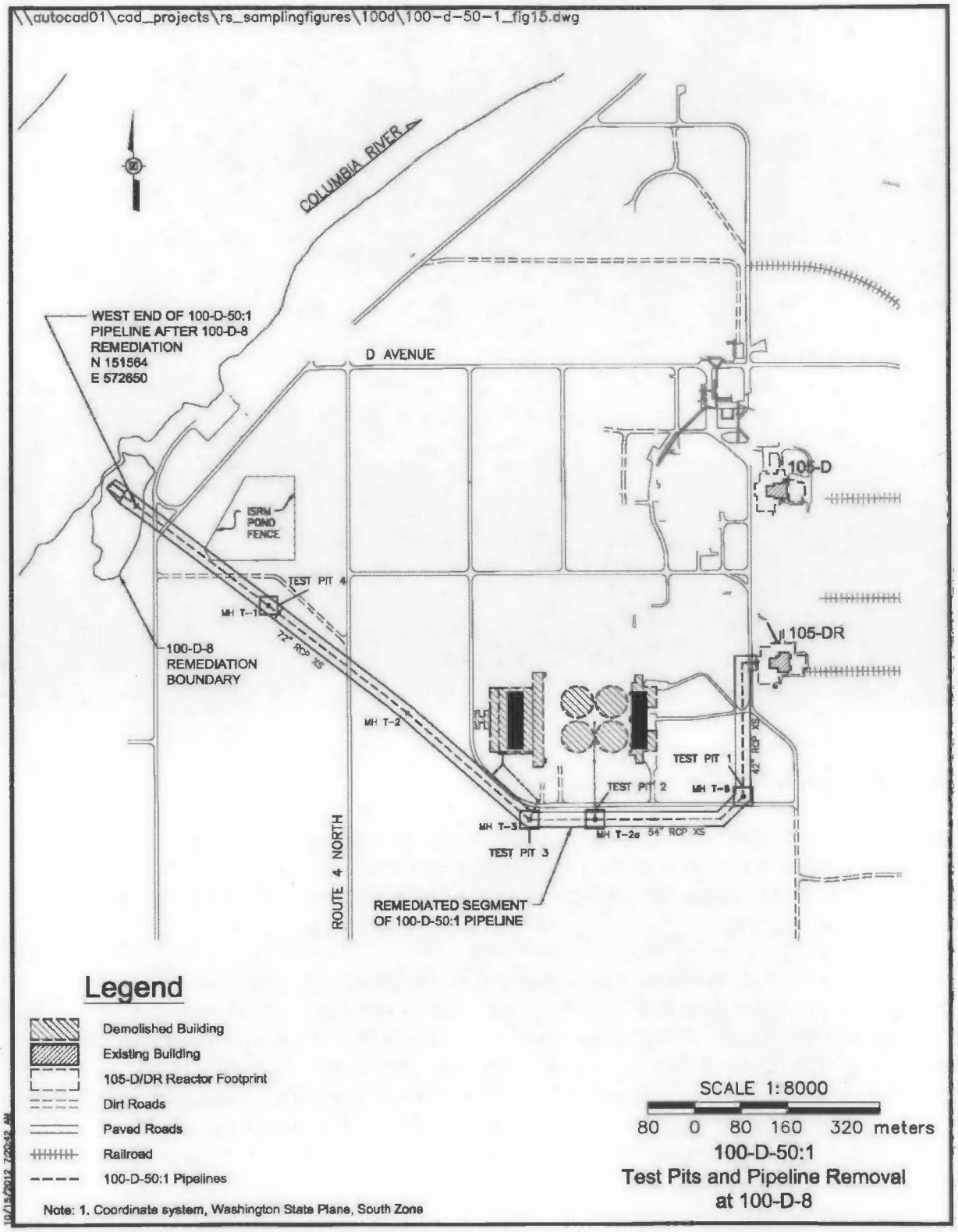


Figure 14. Interior of 100-D-50:1 Pipeline Terminus Within the 100-D-8 Excavation Boundary.

Verification Sampling Results

All verification samples were analyzed using analytical methods approved by EPA (DOE-RL 2009b). Evaluation of the verification data from the 100-D-50:1 subsite was performed by direct comparison of the statistical or maximum sample results for each COPC against cleanup criteria.

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

Comparisons of the results for site COPCs with the RAGs for each of the 100-D-50:1 decision units are listed in Tables 9 through 13. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2012) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in these tables. The complete laboratory results are stored in the ENRE project-specific database prior to submitting to the HEIS for archiving and are provided in Appendix B.

Table 9. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Excavation Area Verification Statistical Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (pCi/g)	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		
Carbon-14	0.961	-- [c]	-- [c]	No	--
Uranium-233/234	0.624 (<BG)	1.1 [d]	1.1 [d]	No	--
Uranium-238	0.636 (<BG)	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?**
		Soil Cleanup Level for Groundwater Protection	**Soil Cleanup Level for River Protection**		
Arsenic	2.79 (<BG)	20 [d]	20 [d]	No	--
Barium	78.2 (<BG)	200	400	No	--
Beryllium	0.321 (<BG)	1.51 [d]	1.51 [d]	No	--
Boron [e]	2.08	320	-- [f]	No	--
Chromium	9.70 (<BG)	18.5 [d]	18.5 [d]	No	--
Cobalt	8.31 (<BG)	15.7 [d]	-- [f]	No	--
Copper	14.5 (<BG)	59.2	22.0 [d]	No	--
Lead	4.32 (<BG)	10.2 [d]	10.2 [d]	No	--
Manganese	356 (<BG)	512 [d]	512 [d]	No	--
Molybdenum [e]	0.561	8	-- [f]	No	--
Nickel	10.4 (<BG)	19.1 [d]	27.4	No	--
Vanadium	68.2 (<BG)	85.1 [d]	-- [f]	No	--
Zinc	45.5 (<BG)	480	67.8 [d]	No	--
Chloride	1.4 (<BG)	25,000	-- [f]	No	--
Nitrogen in nitrate	2.0 (<BG)	1,000	2,000	No	--
Nitrogen in nitrite and nitrate	1.93 (<BG)	1,000	2,000	No	--

Table 9. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Excavation Area Verification Statistical 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		
Sulfate	12.8 (<BG)	25,000	-- [f]	No	--

[a] Lookup values and RAGs obtained from the RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% UCL, depending on data censorship, as described in the *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] No value; because the distribution coefficient (K_d) for this contaminant is greater than 80 mL/g, RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) predicts that the contamination 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) (Ecology 1996). The arsenic cleanup level 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009b).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

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

Table 10. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Excavation Area Verification Focused Sample. (2 Pages)

COPC	Maximum Result [b] (pCi/g)	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		
Tritium	4.64	12.6	25.2	No	--
Uranium-233/234	0.444 (<BG)	1.1 [c]	1.1 [c]	No	--
Uranium-235	0.030 (<BG)	1.1 [c]	1.1 [c]	No	--
Uranium-238	0.452 (<BG)	1.1 [c]	1.1 [c]	No	--
COPC	**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	2.87 (<BG)	20 [c]	20 [c]	No	--
Barium	99.9 (<BG)	200	400	No	--
Beryllium	0.302 (<BG)	1.51 [c]	1.51 [c]	No	--
Boron [d]	2.25	320	-- [c]	No	--
Chromium	8.54 (<BG)	18.5 [c]	18.5 [c]	No	--
Cobalt	8.59 (<BG)	15.7 [c]	-- [c]	No	--
Copper	15.8 (<BG)	59.2	22.0 [c]	No	--
Lead	3.88 (<BG)	10.2 [c]	10.2 [c]	No	--
Manganese	344 (<BG)	512 [c]	512 [c]	No	--
Nickel	10.7 (<BG)	19.1 [c]	27.4	No	--
Vanadium	68.6 (<BG)	85.1 [c]	-- [c]	No	--
Zinc	46.2 (<BG)	480	67.8 [c]	No	--

Table 10. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Excavation Area Verification Focused Sample. (2 Pages)

COPC	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		
Nitrogen in nitrate	7.1 (<BG)	1,000	2,000	No	--
Nitrogen in nitrite and nitrate	7.46 (<BG)	1,000	2,000	No	--
Sulfate	9.5 (<BG)	25,000	-- [f]	No	--

[a] Lookup values and RAGs obtained from the RDR/RAWP (DOE-RL 2009b).
[b] Maximum result as presented in the *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations* (Appendix B).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009b).
[d] No Hanford Site-specific or Washington State background value available.
[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 (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

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

Table 11. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Staging Pile Area Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (pCi/g) [b]	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		
Carbon-14	0.905	8.69	-- [c]	-- [c]	No	--
Cesium-137	0.019	6.2	1,465	2,930	No	--
Uranium-233/234	0.683 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
Uranium-238	0.752 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
COPC	**Statistical or Maximum Result (mg/kg) [b]**	**Soil Cleanup Levels (mg/kg) [a]**			**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	Protective of Groundwater	Protective of the River		
Antimony	0.987 (<BG)	32	5 [d]	5 [d]	No	--
Arsenic	3.14 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	69.0 (<BG)	5,600	200	400	No	--
Beryllium	0.283 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	2.23	7,200	320	-- [g]	No	--
Cadmium	0.237 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium, total	10.3 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	7.85 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	15.7 (<BG)	2,960	59.2	22.0 [d]	No	--
Lead	6.20 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	338 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.0430 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.652	400	8	-- [g]	No	--

Table 11. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 Staging Pile Area Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (mg/kg) [b]	Soil Cleanup Levels (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Protective of Groundwater	Protective of the River		
Nickel	10.6 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	64.8 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	46.9 (<BG)	24,000	480	67.8 [d]	No	--
Chloride	12.6 (<BG)	--	25,000	-- [g]	No	--
Fluoride	1.5 (<BG)	4,800	96	400	No	--
Nitrogen in nitrate	43.9	128,000	1,000	2,000	No	--
Nitrogen in nitrite and nitrate	40.3	128,000	1,000	2,000	No	--
Sulfate	42.7 (<BG)	--	25,000	-- [g]	No	--
Bis(2-ethylhexyl) phthalate	0.147	71.4	0.6	0.36	No	--

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b) unless otherwise noted. Radionuclide soil activities protective of groundwater and the river were calculated using RESRAD Version 6.4 assuming that no uncontaminated vadose zone exists between the contaminated zone and groundwater.

[b] The statistical or maximum values for each COPC is determined in the 95% UCL calculation, which is presented in Appendix B.

[c] No value because the distribution coefficient (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 levels (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] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) using an airborne particulate mass-loading rate of 0.0001 g/m3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

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

[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 (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 12. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 North Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (pCi/g) [b]	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		
Carbon-14	0.989	8.69	-- [c]	-- [c]	No	--
Cesium-137	0.018	6.2	1,465	2,930	No	--
Uranium-233/234	0.525 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
Uranium-235	0.114 (<BG)	0.61	0.5 [d]	0.5 [d]	No	--
Uranium-238	0.567 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--

Table 12. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 North Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (mg/kg) [b]	Soil Cleanup Levels (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Protective of Groundwater	Protective of the River		
Arsenic	2.66 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	70.0 (<BG)	5,600	200	400	No	--
Beryllium	0.278 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	1.80	7,200	320	-- [g]	No	--
Cadmium	0.140 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium, total	9.52 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	8.21 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [d]	No	--
Lead	3.70 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	361 (<BG)	3,760	512 [d]	512 [d]	No	--
Molybdenum [f]	0.893	400	8	-- [g]	No	--
Nickel	12.2 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	80.5 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	49.4(<BG)	24,000	480	67.8 [d]	No	--
Chloride	2.0 (<BG)	--	25,000	-- [g]	No	--
Nitrogen in nitrate	2.2 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrite	0.9	8,000	100	200	No	--
Nitrogen in nitrite and nitrate	2.49 (<BG)	128,000	1,000	2,000	No	--
Sulfate	4.7 (<BG)	--	25,000	-- [g]	No	--
Diethyl phthalate	0.0647	64,000	1,280	4,600	No	--

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b) unless otherwise noted. Radionuclide soil activities protective of groundwater and the river were calculated using RESRAD Version 6.4 assuming that no uncontaminated vadose zone exists between the contaminated zone and groundwater.

[b] The statistical or maximum values for each COPC is determined in the 95% UCL calculation, which is presented in Appendix B.

[c] No value because the distribution coefficient (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 levels (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] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

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

[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 (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose assessment model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 13. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 South Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (pCi/g) [b]	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		
Carbon-14	1.27	8.69	-- [c]	-- [c]	No	--
Cesium-137	0.041	6.2	1,465	2,930	No	--
Uranium-233/234	0.639 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
Uranium-238	0.552 (<BG)	1.1 [d]	1.1 [d]	1.1 [d]	No	--
COPC	**Statistical or Maximum Result (mg/kg) [b]**	**Soil Cleanup Levels (mg/kg) [a]**			**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	**Protective of Groundwater**	**Protective of the River**		
Arsenic	3.07 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	70.3 (<BG)	5,600	200	400	No	--
Beryllium	0.310 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	2.07	7,200	320	-- [g]	No	--
Cadmium	0.119 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium, total	10.0 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	8.03 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	16.3 (<BG)	2,960	59.2	22.0 [d]	No	--
Lead	4.42 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	365 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.0308 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.477	400	8	-- [g]	No	--
Nickel	12.3 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	71.2 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	49.1 (<BG)	24,000	480	67.8 [d]	No	--
Chloride	3.9 (<BG)	--	25,000	-- [g]	No	--
Nitrogen in nitrate	9.9 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrite and nitrate	10.3 (<BG)	128,000	1,000	2,000	No	--
Sulfate	20.5 (<BG)	--	25,000	-- [g]	No	--
Aroclor-1254	0.00346	0.5	0.017 [h]	0.017 [h]	No	--
Aroclor-1260	0.00389	0.5	0.017 [h]	0.017 [h]	No	--

Table 13. Comparison of Contaminant Concentrations to Action Levels for the 100-D-50:1 South Overburden Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result (mg/kg) [b]	Soil Cleanup Levels (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Protective of Groundwater	Protective of the River		
Total PCBs	0.00735	0.5	0.017 [h]	0.017 [h]	No	--

[a] Lookup values and RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b) unless otherwise noted. Radionuclide soil activities protective of groundwater and the river were calculated using RESRAD Version 6.4 assuming that no uncontaminated vadose zone exists between the contaminated zone and groundwater.

[b] The statistical or maximum values for each COPC is determined in the 95% UCL calculation, which is presented in Appendix B.

[c] No value because the distribution coefficient (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 levels (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] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) using an airborne particulate mass-loading rate of 0.0001 g/m3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

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

[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 (Ecology 2012) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

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

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

CLEANUP VERIFICATION DATA EVALUATION

This section demonstrates that remedial action at the 100-D-50:1 subsite has achieved the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 100 Area RDR/RAWP (DOE-RL 2009b).

Direct Exposure RAG Evaluation

The 100-D-50:1 pipeline exists entirely within the deep zone (greater than 4.6 m [15 ft] bgs). Therefore, sample results from the Service Area 2 excavation area, which were located beneath the location of the former pipeline, are not considered within the direct exposure scenario. Evaluation of the Service Area 2 verification sampling results from the shallow zone SPA, north overburden, and south overburden decision units indicates that residual concentrations of all radionuclide and nonradionuclide COPCs were less than direct exposure RAGs.

Radionuclide Soil RAGs for Groundwater and River Protection Attained

No radionuclides were detected above soil lookup values for protection of groundwater and the Columbia River in the verification samples from any of the decision units. However, as discussed in the confirmatory sampling data evaluation, residual radionuclide activities in excess of soil lookup values for protection of groundwater and the Columbia River were detected in the confirmatory sample of pipe scabble collected from Service Area 1. All radionuclide activities

reported in verification samples are less than those reported in confirmatory samples, with the exception of a single detection of tritium at the Focused Sample 1 location.

Site-specific modeling using RESRAD (WCH 2012a) was performed using the maximum radionuclide activities from amongst all radionuclides detected in both confirmatory (including pipe sediment and scabble) and verification soil samples (Table 14). The site-specific model indicates that only tritium is predicted migrate to groundwater within 1,000 years at a maximum activity of 2,667 pCi/L occurring at 27.62 years, well below the RAG of 20,000 pCi/L (Table 15). Therefore, residual activity levels of radionuclides measured at the 100-D-50:1 subsite are protective of groundwater and the Columbia River.

Table 14. Maximum Radionuclide Concentrations Results from 100-D-50:1 Confirmatory and Verification Sampling Input to RESRAD (WCH 2012a).

Radionuclide	Maximum Concentration (pCi/g)	Sample Location and Matrix
Carbon-14	4180	Confirmatory test pit 3, soil
Cesium-137	60.6	Confirmatory test pit 1, pipe scabble
Cobalt-60	4.55	Confirmatory test pit 1, pipe scabble
Europium-152	9.66	Confirmatory test pit 1, pipe scabble
Nickel-63	39.4	Confirmatory test pit 1, pipe scabble
Strontium-90	79.5	Confirmatory test pit 1, pipe scabble
Tritium	4.64	Verification focused sample 1

RESRAD= RESidual RADioactivity (dose assessment model)

Table 15. 100-D-50:1 Groundwater Radionuclide Activities Predicted by RESRAD (WCH 2012a).

Radionuclides	Vadose Zone Horizon	Groundwater Concentrations in pCi/L at Each Time Slice (yr)								RAGs (pCi/L [a])
		0	1	10	27	27.62	28	100	1,000	
C-14	Deep	0	0	0	0	0	0	0	0	2,000
Co-60	Deep	0	0	0	0	0	0	0	0	100
Cs-137	Deep	0	0	0	0	0	0	0	0	60
Eu-152	Deep	0	0	0	0	0	0	0	0	200
Tritium	Deep	0	0	0	2,517	2,667	2,547	0.246	0	20,000
Ni-63	Deep	0	0	0	0	0	0	0	0	50
Sr-90	Deep	0	0	0	0	0	0	0	0	8

[a] Based on radionuclide drinking water RAGs, as discussed in Appendix B and Table B-6 of the RDR/RAWP (DOE-RL 2009b).

RAG = remedial action goal

RESRAD = RESidual RADioactivity (dose assessment model)

The maximum all-pathways predicted dose rate is 0.163 mrem/yr shown in Table 16. The maximum radiological dose is only predicted to occur during the time period of the peak dose contribution due to tritium at year 27.62 and is much less than the dose limitation of 15 mrem/yr.

Table 16. 100-D-50:1 All-Pathway Dose Rate (mrem/yr) Predicted by RESRAD (WCH 2012a).

Vadose Zone Horizon	Predicted "All Pathways" Dose Contributions in mrem/yr at Each Time Slice (yr)							
	0	1	10	27	27.62	28	100	1,000
Deep zone	0	0	0	0.154	0.163	0.156	0	0

RESRAD = RESidual RADioactivity (dose assessment model)

Nonradionuclide Soil RAGs for Groundwater and River Protection Attained

Tables 9 through 13 compare the verification sample results to the applicable soil RAGs for protection of groundwater and protection of the Columbia River. Evaluation of the results indicates that residual concentrations of all nonradionuclide COPCs were quantified below groundwater and/or river protection soil RAGs.

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-50:1 subsite is included in the statistical calculations, where half or more of the data set was detected (Appendix B). The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs, with the exception of vanadium. Three statistical samples from the north overburden had vanadium concentrations that exceeded the cleanup criteria for protection of groundwater. However, the residual concentrations of vanadium are not expected to migrate vertically in 1,000 years (based on the K_d of 1,000 mL/g for vanadium). Therefore, residual concentrations of COPCs 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 all residual COPC concentrations defaulting to the maximum value pass the three-part test in comparison against applicable RAGs and are therefore 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 x 10^{-6}, and a cumulative carcinogenic risk of less than 1 x 10^{-5}. For the 100-D-50:1 subsite, only verification sample results from shallow zone decision units (north overburden, south overburden, and SPA) were included in the calculation. The 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 5.3 x 10^{-3}. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1 x 10^{-6}, and the cumulative carcinogenic risk value was 1.7 x 10^{-8}, which is less than 1 x 10^{-5}. The 100-D-50:1 subsite meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-50:1 subsite included calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1 x 10^{-6}, and a cumulative excess carcinogenic risk of less than 1 x 10^{-5}. These risk values were conservatively calculated for the entire subsite using the highest value for each COPC from each of the decision units. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for which there is no background value. In addition, the K_d values for these contaminants are less than that necessary to show no migration to groundwater in 1,000 years based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b). Based on this model and a vadose zone of approximately 14 m (46 ft) in thickness at the excavation, a K_d of 5.3 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-50:1 subsite is 7.4 x 10^{-2}, which is less than 1.0. The 100-D-50:1 subsite does not have any carcinogenic constituents subject to groundwater cancer risk calculation; therefore, the criterion for excess cancer risk is met. Nonradionuclide risk requirements related to groundwater are met.

Informational Sample Results

The data for informational samples collected from the deep zone 100-D-50:1 pipeline and underlying soil within the 100-D-8 excavation area are presented in Appendix C. In the pipe sediment sample, hexavalent chromium was measured slightly above the river protection RAG for soil. Hexavalent chromium was undetected in the underlying soil. As seen in Figure 14, only a minimal amount of sediment is present in the pipeline and does not present a credible risk for contamination of the river. All other analytes detected in these samples have a K_d value sufficient to show protectiveness as the vadose zone is a minimum of 14 m (46 ft) thick.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed on both the confirmatory and verification data. The DQA compared the sampling approach, the field logbooks (WCH 2005a, 2005b, 2006c, 2006d, 2012b), 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-50:1 subsite established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The confirmatory sampling and cleanup verification sample analytical data are stored in the ENRE project-specific database for data evaluation prior to its archival in the HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix D.

SUMMARY FOR INTERIM CLOSURE

The 100-D-50:1 subsite has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009b). Confirmatory and verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this subsite 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-50:1 subsite to Interim Closed Out. The 100-D-50:1 pipelines exist solely in the deep zone (depth greater than 4.6 m [15 ft] bgs). The acceptability of direct contact with residual deep zone contamination has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are required.

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APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 100-D-50:1 Subsite [a].

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Waste Site Analyses [d]
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
Metals (mg/kg)									
	Background								
Antimony	5	5	--	--	--	78	--	0.27	0.987 (<BG)
Boron	--	0.5	--	--	--	--	--	--	2.23
Manganese	512	1,100 [e]	--	1,500	220	450	4,300	4,000	365 (<BG)
Vanadium	85.1	2	--	--	--	--	7.8	280	80.5 (<BG)
Zinc	67.8	86 [f]	200	360	160	120	46	79	49.4 (<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] Value is the highest maximum or statistical result from the Service Area 2 verification sampling overburden and staging pile area samples. All other confirmatory and verification samples results are from areas more than 4.6 m (15 ft) below ground surface. Per WAC 173-340-7490(4)(b) (Ecology 2001), soil concentrations deeper than the standard point of compliance of 4.6 m (15 ft) are not considered in evaluation of risk to ecological receptors because this represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities, resulting in exposure by ecological receptors.

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

[f] 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.

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

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATION BRIEFS

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

100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations, 0100D-CA-V0482, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-50:1 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0483, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-50:1 Subsite Protection of Groundwater Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0484, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-50:1 Service Area 1 RESRAD Calculation, 0100D-CA-V0272, Rev. 1, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

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

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CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0482

Subject: 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 35 Attm. 1 = 35 Attm. 2 = 10 Total = 81	J. D. Skoglie	N. K. Schiffern	C. H. Dobie	D. F. Obenauer	4/2/13

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** 10/24/12	**Calc. No.** 0100D-CA-V0482	**Rev. No.** 0
Project 100-D Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern	**Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations			**Sheet No.** 1 of 35

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 6 - Calculation Sheet Summary
Sheets 7 to 22 - Calculation Sheet Verification Data - Excavation, Staging Pile Area, North Overburden, and South Overburden.
Sheets 23 to 30 - Ecology Software (MTCAStat) Results
Sheet 31 to 35 - Calculation Sheet - Duplicate Analysis
Attachment 1 - 100-D-50:1, Verification Sampling Results (35 pages)
Attachment 2 - 100-D-50:1, Confirmatory Sampling Results (10 pages)

Given/References:
1) Sample Results (Attachment 1).
2) DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev.5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
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8) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code.*

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

Calculation Description:
The subject calculations were performed on statistical data from soil verification samples (Attachment 1) from the 100-D-50:1 subsite. The data were entered into an EXCEL 2003 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2009b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
The 100-D-50:1 subsite underwent statistical sampling that consists of four decision units for verification sampling; the excavation, staging pile area, north overburden, and south overburden. Confirmatory samples from four test pits were also collected at the 100-D-50:1 subsite in December 2005, and January and April 2006. Only a portion of the pipeline, Service Area 2 represented by samples from test pit 2, was determined to require remediation. All confirmatory sample data is presented in Attachment 2. Data from test pit 2/Service Area 2 samples are not included in site cleanup calculations and evaluations as these data represent the area of the pipeline that has since been remediated. The remediated Service Area 2 portion of the pipeline is represented by the 100-D-50:1 verification sampling results.

Analytical results for all sampling locations are summarized in the tables provided on sheets 4 and 5. 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 10/24/12 Calc. No. 0100D-CA-V0482 Rev. No. 0
Project 100-D Field Remediation Job No. 14655 Checked N. K. Schiffern Date 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations Sheet No. 2 of 35

Summary (continued)

Methodology, continued:

For nonradioactive analytes with ≤50% of the data below detection limits, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, as determined by direct inspection of the sample results (Attachment 1), the maximum detected value for the data set is used instead of the 95% UCL, and no further calculations are performed for those data sets. For convenience, these maximum detected values are included in the summary tables that follow. The 95% UCL was not calculated for data sets with no reported detections. Calculated cleanup levels are not available in Ecology (2011) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance* for Superfund (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COCs/COPCs and are also not included in these calculations. The 95% UCL values were not calculated for potassium-40, radium-226, radium-228, thorium-228, and thorium-232 based on the 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 the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDLs are pre-determined values for analytical methods and constituents with cleanup levels as listed in Table 2-1 of the SAP (DOE-RL 2009a). Table 2-1 includes nominal TDLs for identified methods based organic analyses. The nominal TDLs are also used in support of the RPD calculation for the methods based analytes. TDLs not included in Table 2-1 are based on the laboratory and/or methods used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

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

Washington Closure Hanford **CALCULATION SHEET**

Originator	J. D. Skoglie	**Date**	10/24/12	**Calc. No.**	0100D-CA-V0482	**Rev. No.**	0
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	N. K. Schiffern	**Date**	10/24/12
Subject	100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations					**Sheet No.**	3 of 35

Summary (continued)

QUALIFIER LIST

B = blank contamination
C = method blank contamination (inorganic constituents)
D = dilution
J = estimate
U = undetected

ACRONYM LIST

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 35

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, staging pile area, north overburden, south overburden, 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	Excavation		Staging Pile Area		North Overburden		South Overburden		Units
	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	
Carbon-14	0.961	--	0.905	--	0.989	--	1.27	--	pCi/g
Cesium-137	--	--	0.019	--	0.018	--	0.041	--	pCi/g
Uranium-233/234 (AEA)	0.624	--	0.683	--	0.525	--	0.639	--	pCi/g
Uranium-235 (AEA)	--	--	--	--	0.114	--	--	--	pCi/g
Uranium-238 (AEA)	0.636	--	0.752	--	0.567	--	0.552	--	pCi/g
Antimony	--	--	--	0.987	--	--	--	--	mg/kg
Arsenic	2.79	--	3.14	--	2.66	--	3.07	--	mg/kg
Barium	78.2	--	69.0	--	70.0	--	70.3	--	mg/kg
Beryllium	0.321	--	0.283	--	0.278	--	0.310	--	mg/kg
Boron	2.08	--	2.23	--	1.80	--	2.07	--	mg/kg
Cadmium	--	--	--	0.237	0.140	--	0.119	--	mg/kg
Chromium	9.70	--	10.3	--	9.52	--	10.0	--	mg/kg
Cobalt	8.31	--	7.85	--	8.21	--	8.03	--	mg/kg
Copper	14.5	--	15.7	--	15.5	--	16.3	--	mg/kg
Lead	4.32	--	6.20	--	3.70	--	4.42	--	mg/kg
Manganese	356	--	338	--	361	--	365	--	mg/kg
Mercury	--	--	--	0.0430	--	--	--	0.0308	mg/kg
Molybdenum	--	0.561	--	0.652	0.893	--	0.477	--	mg/kg
Nickel	10.4	--	10.6	--	12.2	--	12.3	--	mg/kg
Vanadium	68.2	--	64.8	--	80.5	--	71.2	--	mg/kg
Zinc	45.5	--	46.9	--	49.4	--	49.1	--	mg/kg
Chloride	1.4	--	12.6	--	--	2.0	3.9	--	mg/kg
Fluoride	--	--	--	1.5	--	--	--	--	mg/kg
Nitrate as nitrogen [b]	2.0	--	43.9	--	2.2	--	9.9	--	mg/kg
Nitrite as nitrogen [b]	--	--	--	--	--	0.9	--	--	mg/kg
Nitrogen in Nitrate and nitrite	1.93	--	40.3	--	2.49	--	10.3	--	mg/kg
Sulfate	12.8	--	42.7	--	4.7	--	20.5	--	mg/kg
Aroclor-1254	--	--	--	--	--	--	--	3.46	ug/kg
Aroclor-1260	--	--	--	--	--	--	--	3.89	ug/kg
Bis(2-ethylhexyl)phthalate	--	--	--	147	--	--	--	--	ug/kg
Diethyl phthalate	--	--	--	--	--	64.7	--	--	ug/kg

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

WAC 173-340 3-Part Test for most stringent RAG:	EXC		SPA		N-OB		S-OB	
95% UCL or maximum> Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	YES	NO	NO	NO
Any sample > 2x Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO

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

[b] The values for "Nitrate" and "Nitrite" have been converted to "Nitrate as nitrogen" and "Nitrite as nitrogen" respectively.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 5 of 35

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, staging pile area, north overburden, south overburden, 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.

Maximum Results Summary [a]

Analyte	FS-1	Confirmatory Samples [b]								Units
		Test Pit 1		Test Pit 2		Test Pit 3		Test Pit 4		
		Pipe Scabble	Underlying Soil	Pipe Sediment	Underlying Soil	Pipe Sediment	Underlying Soil	Pipe Sediment	Underlying Soil	
Carbon-14	--	11.4	200	--	271	--	4180	--	79.2	pCi/g
Cesium-137	--	60.6	--	1.28	--	1.92	--	--	--	pCi/g
Cobalt-60	--	4.55	--	--	--	0.167	--	--	--	pCi/g
Europium-152	--	9.66	--	--	--	0.607	--	--	--	pCi/g
Nickel-63	--	39.4	--	3.65	--	6.36	--	--	--	pCi/g
Total beta radiostrontium	--	79.5	--	--	--	--	--	--	1.66	pCi/g
Tritium	4.64	--	--	--	--	--	--	--	--	pCi/g
Uranium-233/234 (AEA)	0.444	0.407	0.446	0.203	0.534	0.498	0.504	0.194	0.595	pCi/g
Uranium-235 (AEA)	0.030	--	--	--	--	--	--	--	--	pCi/g
Uranium-238 (AEA)	0.452	0.494	0.539	0.518	0.882	0.448	0.701	--	0.622	pCi/g
Antimony	--	1.8	--	--	0.64	3.5	0.54	22.6	--	mg/kg
Arsenic	2.87	7.4	2.0	7.9	3.0	7.0	3.2	44.0	2.4	mg/kg
Barium	99.9	63.5	58.0	159	57.2	116	69.7	58.7	85.3	mg/kg
Beryllium	0.302	0.55	0.21	0.40	0.19	0.27	0.25	0.12	0.33	mg/kg
Boron	2.25	3.6	0.69	8.8	0.36	6.7	0.75	5.6	0.92	mg/kg
Cadmium	--	0.83	--	2.2	--	1.4	0.12	--	0.13	mg/kg
Chromium	8.54	66.6	8.5	375	11.3	103	9.8	251	6.8	mg/kg
Cobalt	8.59	7.4	6.8	15.1	4.8	8.5	6.4	26.8	7.2	mg/kg
Copper	15.8	123	14.6	96.7	11.7	57.3	13.9	990	14.0	mg/kg
Hexavalent chromium	--	--	--	--	--	--	0.21	--	--	mg/kg
Lead	3.88	233	2.9	129	3.0	57.6	3.9	47.1	4.3	mg/kg
Manganese	344	306	279	1030	248	450	285	1610	335	mg/kg
Mercury	--	6.7	--	6.1	--	3.1	--	1.2	--	mg/kg
Molybdenum	--	2.3	--	--	--	--	--	20.7	0.18	mg/kg
Nickel	10.7	39.4	10.0	37.8	10.5	22.5	10.3	368	9.4	mg/kg
Selenium	--	0.64	--	--	--	--	--	--	--	mg/kg
Silver	--	0.49	--	--	--	--	--	--	--	mg/kg
Vanadium	68.6	31.7	43.3	54.8	25.1	37.6	36.4	21.5	37.2	mg/kg
Zinc	46.2	75.7	37.5	467	31.9	270	35.3	185	36.9	mg/kg
Nitrate as nitrogen [c]	7.1	--	--	--	--	--	--	--	--	mg/kg
Nitrogen in Nitrate and nitrite	7.46	--	--	--	--	--	--	--	--	mg/kg
Sulfate	9.5	--	--	--	--	--	--	--	--	mg/kg
4,4'-DDE	--	--	--	28	--	--	--	--	--	ug/kg
4,4'-DDT	--	--	--	88	--	22	--	--	--	ug/kg
Anthracene	--	--	--	4700	--	250	--	--	--	ug/kg
Aroclor-1260	--	42	--	150	--	73	--	--	--	ug/kg
Benzo(a)anthracene	--	--	--	34000	--	2700	--	--	--	ug/kg
Benzo(a)pyrene	--	--	--	32000	--	3000	--	--	--	ug/kg
Benzo(b)fluoranthene	--	--	--	38000	--	2800	--	--	--	ug/kg
Benzo(ghi)perylene	--	--	--	19000	--	1800	--	--	--	ug/kg
Benzo(k)fluoranthene	--	--	--	25000	--	2500	--	--	--	ug/kg
Bis(2-ethylhexyl)phthalate	--	--	970	2700	1000	1500	1500	840	910	ug/kg
Carbazole	--	--	--	5400	--	--	--	--	--	ug/kg
Chrysene	--	--	--	39000	--	3200	--	--	--	ug/kg
Di-n-butylphthalate	--	51	--	--	20	--	--	--	--	ug/kg
Dibenz(a,h)anthracene	--	--	--	6400	--	--	--	--	--	ug/kg
Endosulfan I	--	--	--	11	--	--	--	--	--	ug/kg
Endosulfan II	--	--	--	14	--	--	--	--	--	ug/kg
Endrin aldehyde	--	--	--	41	--	17	--	--	--	ug/kg
Endrin ketone	--	--	--	77	--	--	--	--	--	ug/kg
Fluoranthene	--	34	--	73000	--	4400	--	--	--	ug/kg
Indeno(1,2,3-cd)pyrene	--	--	--	17000	--	1700	--	--	--	ug/kg
Methoxychlor	--	--	--	--	--	--	--	9.0	--	ug/kg
Phenanthrene	--	23	--	26000	--	850	--	--	--	ug/kg
Pyrene	--	22	--	47000	--	3300	--	--	--	ug/kg

[a] The 95% UCL result or maximum value, depending on data censorship, as described in the methodology section.
[b] Data from test pit 2 are for information only as these data represent the area of the pipeline that has since been remediated.
[c] The values for "Nitrate" and "Nitrite" have been converted to "Nitrate as nitrogen" and "Nitrite as nitrogen" respectively.

Washington Closure Hanford **CALCULATION SHEET**

Washington Closure Hanford

Originator	J. D. Skoglie	Date	10/24/12	Calc. No.	0100D-CA-V0482
Project	100-D Field Remediation	Job No.	14655	Checked	N. K. Schiffern
Subject	100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 10/24/12
Sheet No. 6 of 35

Summary (continued)

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, staging pile area, north overburden, south overburden, 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.

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

Analyte	Duplicate Analysis				
	Excavation	Staging Pile Area	North Overburden	South Overburden	Test Pit 3 - J10VF2
Cesium-137					3.2%
Europium-152					14.3%
Potassium-40	4.0%	4.7%	10.1%	19.5%	
Radium-226		1.4%			
Aluminum	5.4%	7.4%	2.3%	7.5%	10.1%
Barium	8.0%	6.8%	2.3%	2.3%	12.8%
Cadmium					15.4%
Calcium	11.3%	3.8%	0.0%	5.8%	59.2%
Chromium	23.4%	10.9%	11.7%	3.2%	5.5%
Copper	1.6%	3.2%	0.7%	0.6%	9.1%
Iron	5.3%	7.8%	1.6%	4.4%	18.9%
Lead					13.5%
Magnesium	6.9%	4.1%	5.6%	6.7%	1.7%
Manganese	5.9%	4.5%	1.4%	7.2%	2.0%
Mercury					21.4%
Nickel					7.9%
Silicon	51.3%	0.8%	5.7%	17.2%	15.2%
Sodium	7.1%	2.9%	11.4%	15.1%	19.6%
Vanadium	2.8%	11.5%	0.5%	3.4%	4.1%
Zinc	6.0%	6.5%	3.6%	0.2%	8.1%
Chloride		10.2%			
Nitrate as nitrogen		4.8%			
Nitrogen in nitrate and nitrite		7.6%			
Sulfate		12.5%			

Grey cells indicate not applicable.

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

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 7 of 35

100-D-50:1 Statistical Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Carbon-14 pCi/g	Carbon-14 Q	Carbon-14 MDA	Uranium-233/234 (AEA) pCi/g	Uranium-233/234 (AEA) Q	Uranium-233/234 (AEA) MDA	Uranium-238 (AEA) pCi/g	Uranium-238 (AEA) Q	Uranium-238 (AEA) MDA
EXC-9	J1R0V0	8/30/12	0.510	UJ	0.903	0.610		0.187	0.610		0.187
Duplicate of J1R0V0	J1R0V5	8/30/12	0.788	UJ	0.863	0.544		0.198	0.674		0.198
EXC-1	J1R0T2	8/30/12	0.819	UJ	0.829	0.725		0.198	0.414		0.198
EXC-2	J1R0T3	8/30/12	1.05	J	0.803	0.476		0.165	0.432		0.165
EXC-3	J1R0T4	8/30/12	0.682	UJ	0.823	0.455		0.158	0.600		0.158
EXC-4	J1R0T5	8/30/12	0.899	J	0.886	0.574		0.163	0.766		0.163
EXC-5	J1R0T6	8/30/12	1.12	J	0.795	0.510		0.170	0.311		0.170
EXC-6	J1R0T7	8/30/12	0.734	UJ	0.862	0.596		0.182	0.715		0.182
EXC-7	J1R0T8	8/30/12	0.429	UJ	0.857	0.635		0.174	0.839		0.174
EXC-8	J1R0T9	8/30/12	1.64	J	0.852	0.669		0.190	0.520		0.190
EXC-10	J1R0V1	8/30/12	0.481	UJ	0.890	0.524		0.200	0.602		0.200
EXC-11	J1R0V2	8/30/12	0.726	UJ	0.864	0.702		0.192	0.251		0.192
EXC-12	J1R0V3	8/30/12	0.106	UJ	0.880	0.546		0.174	0.523		0.174

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Carbon-14 pCi/g			Uranium-233/234 (AEA) pCi/g			Uranium-238 (AEA) pCi/g		
EXC-9	J1R0V0/ J1R0V5	8/30/12	0.649			0.577			0.642		
EXC-1	J1R0T2	8/30/12	0.819			0.725			0.414		
EXC-2	J1R0T3	8/30/12	1.05			0.476			0.432		
EXC-3	J1R0T4	8/30/12	0.682			0.455			0.600		
EXC-4	J1R0T5	8/30/12	0.899			0.574			0.766		
EXC-5	J1R0T6	8/30/12	1.12			0.510			0.311		
EXC-6	J1R0T7	8/30/12	0.734			0.596			0.715		
EXC-7	J1R0T8	8/30/12	0.429			0.635			0.839		
EXC-8	J1R0T9	8/30/12	1.64			0.669			0.520		
EXC-10	J1R0V1	8/30/12	0.481			0.524			0.602		
EXC-11	J1R0V2	8/30/12	0.726			0.702			0.251		
EXC-12	J1R0V3	8/30/12	0.106			0.546			0.523		

Statistical Computations

	Carbon-14			Uranium-233/234 (AEA)			Uranium-238 (AEA)		
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.		
N	12			12			12		
% < Detection limit	67%			0%			0%		
Mean	0.778			0.582			0.551		
Standard deviation	0.386			0.0867			0.179		
Z-statistic	1.64			1.64			1.64		
95% UCL on mean	0.961			0.624			0.636		
Maximum value	1.64			0.725			0.839		

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
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Calc. No. 0100D-CA-V0482
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100-D-50:1 Statistical Calculations

Verification Data - Excavation

1	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Chromium			Cobalt			Copper			Lead			Manganese			Nickel		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	EXC-9	J1R0V0	8/30/12	2.48		2.28	71.6		1.14	0.260	B	0.456	4.56	U	4.56	9.51		0.456	7.58		4.56	12.9		2.28	3.47		1.14	331		11.4	10.4		9.11
4	Duplicate of J1R0V0	J1R0V5	8/30/12	2.21	B	2.65	66.1		1.33	0.241	B	0.531	5.31	U	5.31	7.52		0.531	7.28		5.31	12.7		2.65	3.25		1.33	312		13.3	8.81	B	10.6
5	EXC-1	J1R0T2	8/30/12	2.50	B	2.53	74.9		1.26	0.308	B	0.506	1.44	B	5.06	9.09		0.506	7.97		5.06	14.4		2.53	3.96		1.26	375		12.6	10.2		10.1
6	EXC-2	J1R0T3	8/30/12	2.70		2.60	70.7		1.30	0.289	B	0.520	1.38	B	5.20	9.42		0.520	8.45		5.20	14.8		2.60	3.91		1.30	366		13.0	9.85	B	10.4
7	EXC-3	J1R0T4	8/30/12	2.38	B	2.60	60.0		1.30	0.254	B	0.519	5.19	U	5.19	8.61		0.519	8.51		5.19	14.6		2.60	3.30		1.30	329		13.0	9.04	B	10.4
8	EXC-4	J1R0T5	8/30/12	2.56	B	2.59	82.6		1.30	0.323	B	0.519	1.45	B	5.19	8.98		0.519	8.67		5.19	15.3		2.59	4.74		1.30	355		13.0	9.91	B	10.4
9	EXC-5	J1R0T6	8/30/12	3.04		2.68	78.6		1.34	0.335	B	0.536	1.49	B	5.36	10.3		0.536	7.97		5.36	14.1		2.68	4.64		1.34	339		13.4	10.2	B	10.7
10	EXC-6	J1R0T7	8/30/12	2.93		2.55	81.7		1.28	0.352	B	0.510	1.61	B	5.10	10.4		0.510	7.80		5.10	14.1		2.55	4.40		1.28	341		12.8	10.3		10.2
11	EXC-7	J1R0T8	8/30/12	2.74		2.46	80.6		1.23	0.332	B	0.493	1.44	B	4.93	8.96		0.493	8.21		4.93	13.8		2.46	4.44		1.23	360		12.3	10.1		9.86
12	EXC-8	J1R0T9	8/30/12	2.64		2.55	82.4		1.28	0.311	B	0.510	1.39	B	5.10	10.0		0.510	7.98		5.10	13.5		2.55	4.11		1.28	347		12.8	11.9		10.2
13	EXC-10	J1R0V1	8/30/12	2.71		2.51	80.7		1.25	0.322	B	0.502	1.55	B	5.02	10.1		0.502	8.31		5.02	14.3		2.51	4.34		1.25	359		12.5	10.5		10.0
14	EXC-11	J1R0V2	8/30/12	2.32	B	2.42	68.8		1.21	0.281	B	0.485	4.85	U	4.85	7.11		0.485	8.32		4.85	14.7		2.42	3.62		1.21	345		12.1	8.83	B	9.69
15	EXC-12	J1R0V3	8/30/12	3.02		2.69	62.0		1.35	0.266	B	0.539	5.39	U	5.39	9.13		0.539	7.13		5.39	13.6		2.69	3.79		1.35	312		13.5	9.24	B	10.8

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	EXC-9	J1R0V0/ J1R0V5	8/30/12	2.35	68.9	0.251	2.47	8.52	7.43	12.8	3.36	322	9.61
20	EXC-1	J1R0T2	8/30/12	2.50	74.9	0.308	1.44	9.09	7.97	14.4	3.96	375	10.2
21	EXC-2	J1R0T3	8/30/12	2.70	70.7	0.289	1.38	9.42	8.45	14.8	3.91	366	9.85
22	EXC-3	J1R0T4	8/30/12	2.38	60.0	0.254	2.60	8.61	8.51	14.6	3.30	329	9.04
23	EXC-4	J1R0T5	8/30/12	2.56	82.6	0.323	1.45	8.98	8.67	15.3	4.74	355	9.91
24	EXC-5	J1R0T6	8/30/12	3.04	78.6	0.335	1.49	10.3	7.97	14.1	4.64	339	10.2
25	EXC-6	J1R0T7	8/30/12	2.93	81.7	0.352	1.61	10.4	7.80	14.1	4.40	341	10.3
26	EXC-7	J1R0T8	8/30/12	2.74	80.6	0.332	1.44	8.96	8.21	13.8	4.44	360	10.1
27	EXC-8	J1R0T9	8/30/12	2.64	82.4	0.311	1.39	10.0	7.98	13.5	4.11	347	11.9
28	EXC-10	J1R0V1	8/30/12	2.71	80.7	0.322	1.55	10.1	8.31	14.3	4.34	359	10.5
29	EXC-11	J1R0V2	8/30/12	2.32	68.8	0.281	2.43	7.11	8.32	14.7	3.62	345	8.83
30	EXC-12	J1R0V3	8/30/12	3.02	62.0	0.266	2.70	9.13	7.13	13.6	3.79	312	9.24

31 **Statistical Computations**

32		Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
33	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	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.
34	N	12	12	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	0%	0%	33%	0%	0%	0%	0%	0%	0%
36	Mean	2.66	74.3	0.302	1.83	9.22	8.06	14.2	4.05	346	9.97
37	Standard deviation	0.25	8.08	0.0335	0.54	0.93	0.45	0.67	0.48	18.6	0.80
38	95% UCL on mean	2.79	78.2	0.321	2.08	9.70	8.31	14.5	4.32	356	10.4
39	Maximum value	3.04	82.6	0.352	1.61	10.4	8.67	15.3	4.74	375	11.9
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	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
41	**WAC 173-340 3-PART TEST**										
42	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (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 (19.1 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 9 of 35

100-D-50:1 Statistical Calculations
Verification Data - Excavation

1	Sample	Sample	Sample	Vanadium			Zinc			Chloride			Nitrate as nitrogen [a]			Nitrogen in nitrate and nitrite			Sulfate		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	EXC-9	J1R0V0	8/30/12	64.4		5.70	41.1		22.8	1.0	B	0.9	2.0	J	0.2	1.68		0.09	9.1		0.9
4	Duplicate of J1R0V0	J1R0V5	8/30/12	62.6		6.63	38.7		26.5	1.1	B	1.0	1.9	J	0.2	1.90		0.10	9.4		1.0
5	EXC-1	J1R0T2	8/30/12	68.5		6.32	46.1		25.3	1.2	B	1.0	1.8	J	0.2	1.79		0.10	10.2		1.0
6	EXC-2	J1R0T3	8/30/12	66.1		6.50	45.8		26.0	1.2	B	0.9	1.3	J	0.2	1.39		0.09	12.0		0.9
7	EXC-3	J1R0T4	8/30/12	70.1		6.49	43.8		26.0	1.0	U	1.0	0.6	JB	0.2	0.65		0.10	5.7		1.0
8	EXC-4	J1R0T5	8/30/12	66.1		6.48	45.3		25.9	1.1	B	1.0	1.6	J	0.2	1.69		0.10	8.4		1.0
9	EXC-5	J1R0T6	8/30/12	65.4		6.71	44.5		26.8	1.0	B	1.0	1.0	JB	0.2	1.19		0.10	6.1		1.0
10	EXC-6	J1R0T7	8/30/12	62.4		6.38	44.3		25.5	1.2	B	1.0	0.5	JB	0.2	0.55		0.10	6.2		1.0
11	EXC-7	J1R0T8	8/30/12	64.6		6.16	45.1		24.6	1.5	B	1.0	1.4	J	0.2	1.40		0.10	14.7		1.0
12	EXC-8	J1R0T9	8/30/12	66.7		6.38	44.8		25.5	1.0	B	1.0	0.6	JB	0.2	0.68		0.10	13.7		1.0
13	EXC-10	J1R0V1	8/30/12	69.4		6.27	47.2		25.1	1.1	B	1.0	0.9	JB	0.2	0.88		0.10	7.1		1.0
14	EXC-11	J1R0V2	8/30/12	72.3		6.06	46.4		24.2	1.7	B	1.0	1.3	J	0.2	1.30		0.10	12.1		1.0
15	EXC-12	J1R0V3	8/30/12	56.9		6.73	40.2		26.9	2.2	B	1.0	3.2	J	0.2	3.14		0.10	16.8		1.0

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	EXC-9	J1R0V0/ J1R0V5	8/30/12	63.5	39.9	1.1	1.9	1.79	9.3
20	EXC-1	J1R0T2	8/30/12	68.5	46.1	1.2	1.8	1.79	10.2
21	EXC-2	J1R0T3	8/30/12	66.1	45.8	1.2	1.3	1.39	12.0
22	EXC-3	J1R0T4	8/30/12	70.1	43.8	0.5	0.6	0.65	5.7
23	EXC-4	J1R0T5	8/30/12	66.1	45.3	1.1	1.6	1.69	8.4
24	EXC-5	J1R0T6	8/30/12	65.4	44.5	1.0	1.0	1.19	6.1
25	EXC-6	J1R0T7	8/30/12	62.4	44.3	1.2	0.5	0.55	6.2
26	EXC-7	J1R0T8	8/30/12	64.6	45.1	1.5	1.4	1.40	14.7
27	EXC-8	J1R0T9	8/30/12	66.7	44.8	1.0	0.6	0.68	13.7
28	EXC-10	J1R0V1	8/30/12	69.4	47.2	1.1	0.9	0.88	7.1
29	EXC-11	J1R0V2	8/30/12	72.3	46.4	1.7	1.3	1.30	12.1
30	EXC-12	J1R0V3	8/30/12	56.9	40.2	2.2	3.2	3.14	16.8

31 **Statistical Computations**

32		Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
33	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
34	N	12	12	12	12	12	12
35	% < Detection limit	0%	0%	8%	0%	0%	0%
36	Mean	66.0	44.5	1.2	1.3	1.37	10.2
37	Standard deviation	4.04	2.26	0.4	0.7	0.71	3.7
38	95% UCL on mean	68.2	45.5	1.4	2.0	1.93	12.8
39	Maximum value	72.3	47.2	2.2	3.2	3.14	16.8
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection
41	**WAC 173-340 3-PART TEST**						
42	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA
45	**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.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 10 of 35

1 **100-D-50:1 Maximum Calculations**

2 **Verification Data - Excavation**

	Sample Area	Sample Number	Sample Date	Molybdenum mg/kg	Q	PQL
3–4						
5	EXC-9	J1R0V0	8/30/12	4.56	U	4.56
6	Duplicate of J1R0V0	J1R0V5	8/30/12	5.31	U	5.31
7	EXC-1	J1R0T2	8/30/12	5.06	U	5.06
8	EXC-2	J1R0T3	8/30/12	0.561	B	5.20
9	EXC-3	J1R0T4	8/30/12	5.19	U	5.19
10	EXC-4	J1R0T5	8/30/12	5.19	U	5.19
11	EXC-5	J1R0T6	8/30/12	5.36	U	5.36
12	EXC-6	J1R0T7	8/30/12	5.10	U	5.10
13	EXC-7	J1R0T8	8/30/12	4.93	U	4.93
14	EXC-8	J1R0T9	8/30/12	5.10	U	5.10
15	EXC-10	J1R0V1	8/30/12	5.02	U	5.02
16	EXC-11	J1R0V2	8/30/12	4.85	U	4.85
17	EXC-12	J1R0V3	8/30/12	5.39	U	5.39

18 **Statistical Computations**

		Molybdenum
19		
20	% < Detection limit	92%
21	Maximum value	0.561
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	8 GW Protection
23	**3-PART TEST**	
24	Maximum > Cleanup Limit?	NO
25	> 10% above Cleanup Limit?	NO
26	Any sample > 2X Cleanup Limit?	NO
27	**3-Part Test Compliance?**	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 11 of 35

100-D-50:1 Statistical Calculations

Verification Data - Staging Pile Area

Sample Area	Sample Number	Sample Date	Carbon-14 pCi/g	Carbon-14 Q	Carbon-14 MDA	Cesium-137 pCi/g	Cesium-137 Q	Cesium-137 MDA	Uranium-233/234 (AEA) pCi/g	Uranium-233/234 (AEA) Q	Uranium-233/234 (AEA) MDA	Uranium-238 (AEA) pCi/g	Uranium-238 (AEA) Q	Uranium-238 (AEA) MDA
SPA-7	J1R0W2	8/29/12	0.428	U	0.878	0.019	U	0.022	0.874		0.186	0.947		0.186
Duplicate of J1R0W2	J1R0W8	8/29/12	1.16		0.889	0.022		0.018	0.590		0.215	0.478		0.215
SPA-1	J1R0V6	8/29/12	0.938		0.829	0.037		0.005	0.556		0.185	0.338		0.185
SPA-2	J1R0V7	8/29/12	0.690	U	0.807	0.013	U	0.013	1.07		0.200	1.15		0.200
SPA-3	J1R0V8	8/29/12	0.426	U	0.857	0.013		0.007	0.556		0.185	0.846		0.185
SPA-4	J1R0V9	8/29/12	0.935		0.836	0.014		0.007	0.437		0.209	0.738		0.209
SPA-5	J1R0W0	8/29/12	0.823	U	0.860	0.039	U	0.039	0.353		0.193	0.454		0.193
SPA-6	J1R0W1	8/29/12	0.621	U	0.849	0.023	U	0.023	0.473		0.190	0.598		0.190
SPA-8	J1R0W3	8/29/12	1.09		0.885	0.025	U	0.025	0.398		0.169	0.574		0.169
SPA-9	J1R0W4	8/29/12	0.986		0.864	0.020	U	0.020	0.427		0.218	0.627		0.218
SPA-10	J1R0W5	8/29/12	0.790	U	0.876	0.020	U	0.020	0.660		0.144	0.642		0.144
SPA-11	J1R0W6	8/29/12	0.775	U	0.859	0.026	U	0.026	0.768		0.218	0.682		0.218
SPA-12	J1R0W7	8/29/12	0.955		0.890	0.039	U	0.039	0.618		0.215	0.477		0.215

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Carbon-14 pCi/g	Cesium-137 pCi/g	Uranium-233/234 (AEA) pCi/g	Uranium-238 (AEA) pCi/g
SPA-7	J1R0W2/ J1R0W8	8/29/12	0.794	0.017	0.732	0.713
SPA-1	J1R0V6	8/29/12	0.938	0.037	0.556	0.338
SPA-2	J1R0V7	8/29/12	0.690	0.007	1.07	1.15
SPA-3	J1R0V8	8/29/12	0.426	0.013	0.556	0.846
SPA-4	J1R0V9	8/29/12	0.935	0.014	0.437	0.738
SPA-5	J1R0W0	8/29/12	0.823	0.020	0.353	0.454
SPA-6	J1R0W1	8/29/12	0.621	0.012	0.473	0.598
SPA-8	J1R0W3	8/29/12	1.09	0.013	0.398	0.574
SPA-9	J1R0W4	8/29/12	0.986	0.010	0.427	0.627
SPA-10	J1R0W5	8/29/12	0.790	0.010	0.660	0.642
SPA-11	J1R0W6	8/29/12	0.775	0.013	0.768	0.682
SPA-12	J1R0W7	8/29/12	0.955	0.020	0.618	0.477

Statistical Computations

	Carbon-14	Cesium-137	Uranium-233/234 (AEA)	Uranium-238 (AEA)
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	50%	67%	0%	0%
Mean	0.819	0.015	0.587	0.653
Standard deviation	0.181	0.008	0.202	0.208
Z-statistic	1.64	1.64	1.64	1.64
95% UCL on mean	0.905	0.019	0.683	0.752
Maximum value	1.16	0.039	1.07	1.15

Acronyms and qualifiers are defined on sheet 3.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 12 of 35

100-D-50:1 Statistical Calculations
Verification Data - Staging Pile Area

1	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Chromium			Cobalt			Copper			Lead			Manganese			Nickel		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	SPA-7	J1R0W2	8/29/12	2.91		2.17	73.9		1.08	0.291	B	0.433	2.58	B	4.33	10.2		0.433	7.49		4.33	15.6		2.17	8.81		1.08	326		10.8	11.1		8.67
4	Duplicate of J1R0W2	J1R0W8	8/29/12	2.89		2.57	79.1		1.28	0.272	B	0.513	2.51	B	5.13	9.15		0.513	7.92		5.13	16.1		2.57	8.74		1.28	341		12.8	9.78	B	10.3
5	SPA-1	J1R0V6	8/29/12	2.23	B	2.69	64.7		1.35	0.266	B	0.539	1.50	B	5.39	9.14		0.539	7.86		5.39	14.2		2.69	4.75		1.35	362		13.5	10.5	B	10.8
6	SPA-2	J1R0V7	8/29/12	2.72	B	2.85	61.9		1.42	0.267	B	0.570	1.71	B	5.70	10.2		0.570	7.72		5.70	14.5		2.85	4.53		1.42	318		14.2	10.1	B	11.4
7	SPA-3	J1R0V8	8/29/12	2.92		2.69	61.6		1.34	0.268	B	0.538	1.74	B	5.38	10.2		0.538	7.07		5.38	14.5		2.69	4.63		1.34	301		13.4	10.9		10.8
8	SPA-4	J1R0V9	8/29/12	2.60	B	2.92	65.3		1.46	0.274	B	0.585	2.46	B	5.85	9.27		0.585	7.96		5.85	16.6		2.92	6.77		1.46	339		14.6	9.84	B	11.7
9	SPA-5	J1R0W0	8/29/12	3.13		2.56	66.0		1.28	0.245	B	0.512	1.67	B	5.12	8.06		0.512	7.98		5.12	16.9		2.56	5.41		1.28	314		12.8	10.2	B	10.2
10	SPA-6	J1R0W1	8/29/12	2.51	B	2.60	59.8		1.30	0.264	B	0.520	1.37	B	5.20	8.66		0.520	7.47		5.20	13.8		2.60	3.73		1.30	306		13.0	9.45	B	10.4
11	SPA-8	J1R0W3	8/29/12	4.04		2.60	66.9		1.30	0.268	B	0.521	1.86	B	5.21	10.1		0.521	7.33		5.21	16.8		2.60	8.81		1.30	312		13.0	9.84	B	10.4
12	SPA-9	J1R0W4	8/29/12	2.55	B	2.57	61.8		1.28	0.269	B	0.514	5.14	U	5.14	8.49		0.514	8.02		5.14	14.4		2.57	4.07		1.28	348		12.8	9.58	B	10.3
13	SPA-10	J1R0W5	8/29/12	3.37		2.56	82.2		1.28	0.342	B	0.512	2.04	B	5.12	13.2		0.512	7.57		5.12	14.6		2.56	4.70		1.28	359		12.8	11.5		10.2
14	SPA-11	J1R0W6	8/29/12	2.81		2.49	60.9		1.24	0.241	B	0.497	4.97	U	4.97	9.08		0.497	7.76		4.97	14.7		2.49	3.92		1.24	311		12.4	10.2		9.94
15	SPA-12	J1R0W7	8/29/12	2.83	B	2.86	61.4		1.43	0.268	B	0.573	1.59	B	5.73	10.3		0.573	7.92		5.73	15.3		2.86	4.03		1.43	322		14.3	11.1	B	11.5

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	SPA-7	J1R0W2/ J1R0W8	8/29/12	2.90	76.5	0.282	2.55	9.68	7.71	15.9	8.78	334	10.4
20	SPA-1	J1R0V6	8/29/12	2.23	64.7	0.266	1.50	9.14	7.86	14.2	4.75	362	10.5
21	SPA-2	J1R0V7	8/29/12	2.72	61.9	0.267	1.71	10.2	7.72	14.5	4.53	318	10.1
22	SPA-3	J1R0V8	8/29/12	2.92	61.6	0.268	1.74	10.2	7.07	14.5	4.63	301	10.9
23	SPA-4	J1R0V9	8/29/12	2.60	65.3	0.274	2.46	9.27	7.96	16.6	6.77	339	9.84
24	SPA-5	J1R0W0	8/29/12	3.13	66.0	0.245	1.67	8.06	7.98	16.9	5.41	314	10.2
25	SPA-6	J1R0W1	8/29/12	2.51	59.8	0.264	1.37	8.66	7.47	13.8	3.73	306	9.45
26	SPA-8	J1R0W3	8/29/12	4.04	66.9	0.268	1.86	10.1	7.33	16.8	8.81	312	9.84
27	SPA-9	J1R0W4	8/29/12	2.55	61.8	0.269	2.57	8.49	8.02	14.4	4.07	348	9.58
28	SPA-10	J1R0W5	8/29/12	3.37	82.2	0.342	2.04	13.2	7.57	14.6	4.70	359	11.5
29	SPA-11	J1R0W6	8/29/12	2.81	60.9	0.241	2.49	9.08	7.76	14.7	3.92	311	10.2
30	SPA-12	J1R0W7	8/29/12	2.83	61.4	0.268	1.59	10.3	7.92	15.3	4.03	322	11.1

31 **Statistical Computations**

32		Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
33	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), 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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
34	N	12	12	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	0%	0%	17%	0%	0%	0%	0%	0%	0%
36	Mean	2.88	65.8	0.271	1.96	9.70	7.70	15.2	5.34	327	10.3
37	Standard deviation	0.47	6.84	0.025	0.44	1.33	0.29	1.09	1.80	20.8	0.62
38	95% UCL on mean	3.14	69.0	0.283	2.23	10.3	7.85	15.7	6.20	338	10.6
39	Maximum value	4.04	82.2	0.342	2.58	13.2	8.02	16.9	8.81	362	11.5
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	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
41	**WAC 173-340 3-PART TEST**										
42	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (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 (19.1 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 13 of 35

100-D-50:1 Statistical Calculations
Verification Data - Staging Pile Area

1	Sample	Sample	Sample	Vanadium			Zinc			Chloride			Nitrate as nitrogen [a]			Nitrogen in nitrate and nitrite			Sulfate		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	SPA-7	J1R0W2	8/29/12	56.7		5.42	44.5		21.7	12.1		1.0	41.1	D	1.1	40.4	D	0.97	86.9		1.0
4	Duplicate of J1R0W2	J1R0W8	8/29/12	63.6		6.42	47.5		25.7	13.4		1.0	43.1	D	1.1	43.6	D	0.99	98.5		1.0
5	SPA-1	J1R0V6	8/29/12	70.7		6.73	44.9		26.9	1.4	B	1.0	2.9		0.2	3.03		0.10	9.4		1.0
6	SPA-2	J1R0V7	8/29/12	64.4		7.12	43.1		28.5	1.8	B	1.0	6.0		0.2	6.04		0.10	13.1		1.0
7	SPA-3	J1R0V8	8/29/12	56.8		6.72	38.7		26.9	1.9	B	1.0	5.9		0.2	6.11		0.10	12.8		1.0
8	SPA-4	J1R0V9	8/29/12	68.1		7.31	52.9		29.2	4.3	B	1.0	12.4		0.2	12.5	D	0.20	18.0		1.0
9	SPA-5	J1R0W0	8/29/12	55.2		6.40	45.8		25.6	17.8		1.0	10.6		0.2	10.7	D	0.20	21.1		1.0
10	SPA-6	J1R0W1	8/29/12	63.0		6.51	41.0		26.0	1.1	B	1.0	2.1		0.2	2.40		0.10	6.5		1.0
11	SPA-8	J1R0W3	8/29/12	55.3		6.51	54.2		26.0	7.8		1.0	33.7	D	0.5	31.5	D	0.50	93.2		1.0
12	SPA-9	J1R0W4	8/29/12	63.8		6.42	42.9		25.7	1.0	U	1.0	2.7		0.2	2.85		0.10	15.4		1.0
13	SPA-10	J1R0W5	8/29/12	56.3		6.40	42.7		25.6	3.0	B	1.0	49.0	D	1.1	47.7	D	0.97	32.5		1.0
14	SPA-11	J1R0W6	8/29/12	65.4		6.21	41.6		24.9	1.3	B	1.0	5.1		0.2	5.01		0.10	7.4		1.0
15	SPA-12	J1R0W7	8/29/12	64.5		7.16	43.3		28.6	2.6	B	1.0	11.7		0.2	12.0	D	0.49	12.1		1.0

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	SPA-7	J1R0W2/ J1R0W8	8/29/12	60.2	46.0	12.8	42.1	42.0	92.7
20	SPA-1	J1R0V6	8/29/12	70.7	44.9	1.4	2.9	3.03	9.4
21	SPA-2	J1R0V7	8/29/12	64.4	43.1	1.8	6.0	6.04	13.1
22	SPA-3	J1R0V8	8/29/12	56.8	38.7	1.9	5.9	6.11	12.8
23	SPA-4	J1R0V9	8/29/12	68.1	52.9	4.3	12.4	12.5	18.0
24	SPA-5	J1R0W0	8/29/12	55.2	45.8	17.8	10.6	10.7	21.1
25	SPA-6	J1R0W1	8/29/12	63.0	41.0	1.1	2.1	2.40	6.5
26	SPA-8	J1R0W3	8/29/12	55.3	54.2	7.8	33.7	31.5	93.2
27	SPA-9	J1R0W4	8/29/12	63.8	42.9	0.5	2.7	2.85	15.4
28	SPA-10	J1R0W5	8/29/12	56.3	42.7	3.0	49.0	47.7	32.5
29	SPA-11	J1R0W6	8/29/12	65.4	41.6	1.3	5.1	5.01	7.4
30	SPA-12	J1R0W7	8/29/12	64.5	43.3	2.6	11.7	12.0	12.1

31 **Statistical Computations**

32		Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
33	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
34	N	12	12	12	12	12	12
35	% < Detection limit	0%	0%	8%	0%	0%	0%
36	Mean	62.0	44.8	4.7	15.3	15.2	27.9
37	Standard deviation	5.18	4.59	5.4	16.5	16.0	31.2
38	95% UCL on mean	64.8	46.9	12.6	43.9	40.3	42.7
39	Maximum value	70.7	54.2	17.8	49.0	47.7	98.5
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection
41	**WAC 173-340 3-PART TEST**						
42	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NO	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NO	NO	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NO	NA
45	**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.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie

Project 100-D Field Remediation

Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12 **Job No.** 14655

Calc. No. 0100D-CA-V0482 **Checked** N. K. Schiffern

Rev. No. 0 **Date** 10/24/12 **Sheet No.** 14 of 35

1 **100-D-50:1 Maximum Calculations**

2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Antimony			Cadmium			Mercury			Molybdenum			Fluoride			Bis(2-ethylhexyl)phthalate		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-7	J1R0W2	8/29/12	1.30	U	1.30	0.162	B	0.433	0.0430		0.0268	0.483	B	4.33	1.0	U	1.0	333	U	333
6	Duplicate of J1R0W2	J1R0W8	8/29/12	1.54	U	1.54	0.171	B	0.513	0.0275	U	0.0275	5.13	U	5.13	1.0	U	1.0	330	U	330
7	SPA-1	J1R0V6	8/29/12	1.62	U	1.62	0.539	U	0.539	0.0251	U	0.0251	0.567	B	5.39	1.0	U	1.0	991	UD	991
8	SPA-2	J1R0V7	8/29/12	1.71	U	1.71	0.570	U	0.570	0.0275	U	0.0275	0.652	B	5.70	1.0	U	1.0	330	U	330
9	SPA-3	J1R0V8	8/29/12	1.61	U	1.61	0.538	U	0.538	0.0266	U	0.0266	5.38	U	5.38	1.0	U	1.0	322	U	322
10	SPA-4	J1R0V9	8/29/12	1.75	U	1.75	0.166	B	0.585	0.0261	U	0.0261	5.85	U	5.85	1.0	U	1.0	332	U	332
11	SPA-5	J1R0W0	8/29/12	1.53	U	1.53	0.149	B	0.512	0.0259	U	0.0259	0.626	B	5.12	1.0	U	1.0	331	U	331
12	SPA-6	J1R0W1	8/29/12	1.56	U	1.56	0.520	U	0.520	0.0232	U	0.0232	5.20	U	5.20	1.0	U	1.0	147	J	330
13	SPA-8	J1R0W3	8/29/12	0.987	B	1.56	0.237	B	0.521	0.0238	U	0.0238	5.21	U	5.21	1.5	B	1.0	330	U	330
14	SPA-9	J1R0W4	8/29/12	1.54	U	1.54	0.514	U	0.514	0.0260	U	0.0260	5.14	U	5.14	1.0	U	1.0	332	U	332
15	SPA-10	J1R0W5	8/29/12	1.54	U	1.54	0.512	U	0.512	0.0275	U	0.0275	5.12	U	5.12	1.0	U	1.0	330	U	330
16	SPA-11	J1R0W6	8/29/12	1.49	U	1.49	0.497	U	0.497	0.0268	U	0.0268	4.97	U	4.97	1.0	U	1.0	333	U	333
17	SPA-12	J1R0W7	8/29/12	1.72	U	1.72	0.573	U	0.573	0.0253	U	0.0253	5.73	U	5.73	1.0	U	1.0	332	U	332

18 **Statistical Computations**

19		Antimony	Cadmium	Mercury	Molybdenum	Fluoride	Bis(2-ethylhexyl)phthalate
20	% < Detection limit	92%	67%	92%	67%	92%	92%
21	Maximum value	0.987	0.237	0.0430	0.652	1.5	147
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	5 GW and River Protection	0.81 GW and River Protection	0.33 GW and River Protection	8 GW Protection	96 GW Protection	360 ug/kg River Protection
23	**3-PART TEST**						
24	Maximum > Cleanup Limit?	NA	NA	NA	NO	NA	NO
25	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NO
26	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NO
27	**3-Part Test Compliance?**	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	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 (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.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 15 of 35

1 **100-D-50:1 Statistical Calculations**
2 **Verification Data - North Overburden**

3	Sample	Sample	Sample	Carbon-14			Cesium-137			Uranium-233/234 (AEA)			Uranium-235 (AEA)			Uranium-238 (AEA)		
4	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
5	N-OB-10	J1R0X8	8/30/12	1.19		0.842	0.024	U	0.024	0.585		0.204	0.032	U	0.246	0.612		0.204
6	Duplicate of J1R0X8	J1R101	8/30/12	0.726	U	0.875	0.021	U	0.021	0.498		0.201	0	U	0.243	0.394		0.201
7	N-OB-1	J1R0W9	8/30/12	0.160	U	0.824	0.023		0.008	0.482		0.184	0.029	U	0.223	0.602		0.184
8	N-OB-2	J1R0X0	8/30/12	0.591	U	0.807	0.007	U	0.007	0.346		0.165	0	U	0.200	0.367		0.165
9	N-OB-3	J1R0X1	8/30/12	0.862		0.760	0.021		0.013	0.370		0.177	0.112	U	0.214	0.370		0.177
10	N-OB-4	J1R0X2	8/30/12	0.865		0.794	0.019	U	0.019	0.346		0.221	0.070	U	0.267	0.462		0.221
11	N-OB-5	J1R0X3	8/30/12	1.11		0.799	0.042	U	0.042	0.542		0.188	0.030	U	0.228	0.566		0.188
12	N-OB-6	J1R1P5	9/4/12	1.80		1.33	0.016	U	0.016	0.484		0.047	0.033		0.035	0.466		0.037
13	N-OB-7	J1R0X5	8/30/12	0.880		0.782	0.022	U	0.022	0.313		0.171	0	U	0.207	0.716		0.171
14	N-OB-8	J1R0X6	8/30/12	0.221	U	0.788	0.019	U	0.019	0.284		0.145	0.023	U	0.175	0.549		0.145
15	N-OB-9	J1R0X7	8/30/12	0.533	U	0.781	0.024	U	0.024	0.526		0.192	0.030	U	0.232	0.275		0.192
16	N-OB-11	J1R0X9	8/30/12	0.761	U	0.837	0.032	U	0.032	0.690		0.176	0	U	0.213	0.598		0.176
17	N-OB-12	J1R100	8/30/12	0.696	U	0.839	0.053	U	0.053	0.632		0.151	0.024	U	0.183	0.612		0.151

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Carbon-14	Cesium-137	Uranium-233/234 (AEA)	Uranium-235 (AEA)	Uranium-238 (AEA)
20	Area	Number	Date	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
21	N-OB-10	J1R0X8/ J1R101	8/30/12	0.958	0.011	0.542	0.122	0.503
22	N-OB-1	J1R0W9	8/30/12	0.160	0.023	0.482	0.112	0.602
23	N-OB-2	J1R0X0	8/30/12	0.591	0.004	0.346	0.100	0.367
24	N-OB-3	J1R0X1	8/30/12	0.862	0.021	0.370	0.107	0.370
25	N-OB-4	J1R0X2	8/30/12	0.865	0.010	0.346	0.134	0.462
26	N-OB-5	J1R0X3	8/30/12	1.11	0.021	0.542	0.114	0.566
27	N-OB-6	J1R1P5	9/4/12	1.80	0.008	0.484	0.033	0.466
28	N-OB-7	J1R0X5	8/30/12	0.880	0.011	0.313	0.104	0.716
29	N-OB-8	J1R0X6	8/30/12	0.221	0.010	0.284	0.088	0.549
30	N-OB-9	J1R0X7	8/30/12	0.533	0.012	0.526	0.116	0.275
31	N-OB-11	J1R0X9	8/30/12	0.761	0.016	0.690	0.107	0.598
32	N-OB-12	J1R100	8/30/12	0.696	0.027	0.632	0.092	0.612

33 **Statistical Computations**

34		Carbon-14	Cesium-137	Uranium-233/234 (AEA)	Uranium-235 (AEA)	Uranium-238 (AEA)
35	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.
36	N	12	12	12	12	12
37	% < Detection limit	50%	83%	0%	92%	0%
38	Mean	0.786	0.014	0.463	0.102	0.507
39	Standard deviation	0.427	0.007	0.131	0.025	0.125
40	Z-statistic	1.64	1.64	1.64	1.64	1.64
41	95% UCL on mean	0.989	0.018	0.525	0.114	0.567
42	Maximum value	1.80	0.053	0.690	0.112	0.716

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

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0

Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12

Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 16 of 35

100-D-50:1 Statistical Calculations

Verification Data - North Overburden

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Arsenic Q	Arsenic PQL	Barium mg/kg	Barium Q	Barium PQL	Beryllium mg/kg	Beryllium Q	Beryllium PQL	Boron mg/kg	Boron Q	Boron PQL	Cadmium mg/kg	Cadmium Q	Cadmium PQL	Chromium mg/kg	Chromium Q	Chromium PQL	Cobalt mg/kg	Cobalt Q	Cobalt PQL	Copper mg/kg	Copper Q	Copper PQL	Lead mg/kg	Lead Q	Lead PQL	Manganese mg/kg	Manganese Q	Manganese PQL
N-OB-10	J1R0X8	8/30/12	2.49		0.911	68.9		0.456	0.285		0.182	1.47	B	1.82	0.110	B	0.182	9.78		0.182	7.33		1.82	15.3		0.911	3.52		0.456	358		4.56
Duplicate of J1R0X8	J1R101	8/30/12	2.62		0.894	67.3		0.447	0.280		0.179	2.53		1.79	0.098	B	0.179	8.70		0.179	7.90		1.79	15.2		0.894	3.48		0.447	363		4.47
N-OB-1	J1R0W9	8/30/12	2.75		0.881	62.1		0.440	0.269		0.176	1.20	B	1.76	0.0984	B	0.176	8.85		0.176	7.33		1.76	15.7		0.881	3.75		0.44	343		4.40
N-OB-2	J1R0X0	8/30/12	2.21		0.899	78.4		0.449	0.262		0.180	0.875	B	1.80	0.0983	B	0.180	7.77		0.180	7.9		1.80	16.1		0.899	3.25		0.449	344		4.49
N-OB-3	J1R0X1	8/30/12	2.32		0.879	62.3		0.439	0.264		0.176	1.28	B	1.76	0.111	B	0.176	8.94		0.176	6.95		1.76	13.6		0.879	4.05		0.439	302		4.39
N-OB-4	J1R0X2	8/30/12	2.32		0.912	60.1		0.456	0.245		0.182	0.985	B	1.82	0.0977	B	0.182	7.85		0.182	7.47		1.82	13.8		0.912	3.18		0.456	326		4.56
N-OB-5	J1R0X3	8/30/12	2.90		0.809	64.9		0.404	0.268		0.162	1.32	B	1.62	0.0972	B	0.162	10.6		0.162	6.97		1.62	15.6		0.809	3.45		0.404	315		4.04
N-OB-6	J1R1P5	9/4/12	2.63		2.61	60.9		1.30	0.289	B	0.521	1.52	B	5.21	0.521	U	0.521	9.13		0.521	8.57		5.21	15.1		2.61	3.44		1.30	384		13.0
N-OB-7	J1R0X5	8/30/12	1.97		0.864	64.3		0.432	0.231		0.173	0.951	B	1.73	0.0981	B	0.173	5.75		0.173	8.54		1.73	14.2		0.864	2.99		0.432	362		4.32
N-OB-8	J1R0X6	8/30/12	1.90		0.810	55.3		0.405	0.242		0.162	0.852	B	1.62	0.111	B	0.162	6.59		0.162	9.08		1.62	14.8		0.810	3.04		0.405	347		4.05
N-OB-9	J1R0X7	8/30/12	2.41		0.928	67.2		0.464	0.242		0.186	1.14	B	1.86	0.106	B	0.186	6.31		0.186	8.03		1.86	15.6		0.928	3.08		0.464	379		4.64
N-OB-11	J1R0X9	8/30/12	2.79		0.947	78.0		0.473	0.305		0.189	2.47		1.89	0.121	B	0.189	11.1		0.189	7.82		1.89	15.3		0.947	4.15		0.473	352		4.73
N-OB-12	J1R100	8/30/12	2.78		0.930	72.0		0.465	0.284		0.186	2.54		1.86	0.114	B	0.186	9.49		0.186	7.99		1.86	15.2		0.930	3.91		0.465	353		4.65

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Lead mg/kg	Manganese mg/kg
N-OB-10	J1R0X8/ J1R101	8/30/12	2.56	68.1	0.283	2.00	0.104	9.24	7.62	15.3	3.50	361
N-OB-1	J1R0W9	8/30/12	2.75	62.1	0.269	1.20	0.0984	8.85	7.33	15.7	3.75	343
N-OB-2	J1R0X0	8/30/12	2.21	78.4	0.262	0.875	0.0983	7.77	7.90	16.1	3.25	344
N-OB-3	J1R0X1	8/30/12	2.32	62.3	0.264	1.28	0.111	8.94	6.95	13.6	4.05	302
N-OB-4	J1R0X2	8/30/12	2.32	60.1	0.245	0.985	0.0977	7.85	7.47	13.8	3.18	326
N-OB-5	J1R0X3	8/30/12	2.90	64.9	0.268	1.32	0.0972	10.6	6.97	15.6	3.45	315
N-OB-6	J1R1P5	9/4/12	2.63	60.9	0.289	1.52	0.261	9.13	8.57	15.1	3.44	384
N-OB-7	J1R0X5	8/30/12	1.97	64.3	0.231	0.951	0.098	5.75	8.54	14.2	2.99	362
N-OB-8	J1R0X6	8/30/12	1.90	55.3	0.242	0.852	0.111	6.59	9.08	14.8	3.04	347
N-OB-9	J1R0X7	8/30/12	2.41	67.2	0.242	1.14	0.106	6.31	8.03	15.6	3.08	379
N-OB-11	J1R0X9	8/30/12	2.79	78.0	0.305	2.47	0.121	11.1	7.82	15.3	4.15	352
N-OB-12	J1R100	8/30/12	2.78	72.0	0.284	2.54	0.114	9.49	7.99	15.2	3.91	353

Statistical Computations

	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	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), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
N	12	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	0%	8%	0%	0%	0%	0%	0%
Mean	2.46	66.1	0.265	1.43	0.118	8.47	7.86	15.0	3.48	347
Standard deviation	0.33	7.06	0.022	0.595	0.0455	1.66	0.65	0.78	0.401	24.1
95% UCL on mean	2.66	70.0	0.278	1.80	0.140	9.52	8.21	15.5	3.70	361
Maximum value	2.90	78.4	0.305	2.54	0.121	11.1	9.08	16.1	4.15	384
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	10.2 GW & River Protection	512 GW & River Protection
WAC 173-340 3-PART TEST										
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	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 (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 17 of 35

100-D-50:1 Statistical Calculations
Verification Data - North Overburden

	Sample Area	Sample Number	Sample Date	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Nitrate as nitrogen [a] mg/kg	Q	PQL	Nitrogen in nitrate and nitrite mg/kg	Q	PQL	Sulfate mg/kg	Q	PQL
3	N-OB-10	J1R0X8	8/30/12	0.368	B	1.82	9.37		3.64	76.1		2.28	46.3		9.11	1.6		0.2	1.83		0.10	3.9	B	1.0
4	Duplicate of J1R0X8	J1R101	8/30/12	0.367	B	1.79	10.8		3.58	75.7		2.24	48.0		8.94	1.6		0.2	1.80		0.09	5.7		0.9
5	N-OB-1	J1R0W9	8/30/12	0.438	B	1.76	10.7		3.52	72.0		2.20	45.9		8.81	2.1		0.2	2.36		0.10	6.1		1.0
6	N-OB-2	J1R0X0	8/30/12	0.487	B	1.80	10.7		3.60	76.0		2.25	47.5		8.99	0.7	B	0.2	0.73		0.10	3.4	B	1.0
7	N-OB-3	J1R0X1	8/30/12	0.373	B	1.76	10.3		3.52	69.4		2.20	46.0		8.79	1.9		0.2	2.24		0.10	5.8		1.0
8	N-OB-4	J1R0X2	8/30/12	0.366	B	1.82	9.53		3.65	74.1		2.28	44.5		9.12	0.7	B	0.2	0.74		0.10	4.0	B	1.0
9	N-OB-5	J1R0X3	8/30/12	0.417	B	1.62	18.2		3.24	66.1		2.02	51.7		8.09	0.9	B	0.2	1.07		0.10	4.7	B	1.0
10	N-OB-6	J1R1P5	9/4/12	5.21	U	5.21	11.9		10.4	73.5		6.52	47.3		26.1	0.9	B	0.2	0.96		0.10	3.2	B	1.0
11	N-OB-7	J1R0X5	8/30/12	0.444	B	1.73	8.59		3.45	87.6		2.16	50.9		8.64	1.0	B	0.2	1.06		0.10	2.6	B	1.0
12	N-OB-8	J1R0X6	8/30/12	0.426	B	1.62	10.1		3.24	87.2		2.03	52.5		8.10	0.4	B	0.2	0.43	B	0.10	3.2	B	1.0
13	N-OB-9	J1R0X7	8/30/12	0.440	B	1.86	9.56		3.71	92.2		2.32	51.4		9.28	0.9	B	0.2	1.10		0.09	2.6	B	0.9
14	N-OB-11	J1R0X9	8/30/12	0.383	B	1.89	11.8		3.79	69.3		2.37	46.1		9.47	3.0		0.2	3.19		0.10	3.5	B	1.0
15	N-OB-12	J1R100	8/30/12	0.353	B	1.86	10.4		3.72	64.1		2.33	46.0		9.30	2.8		0.2	3.06		0.10	4.1	B	1.0

16 **Statistical Computation Input Data**

	Sample Area	Sample Number	Sample Date	Molybdenum mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg	Nitrate as nitrogen [a] mg/kg	Nitrogen in nitrate and nitrite mg/kg	Sulfate mg/kg
19	N-OB-10	J1R0X8/ J1R101	8/30/12	0.368	10.1	75.9	47.2	1.6	1.82	4.8
20	N-OB-1	J1R0W9	8/30/12	0.438	10.7	72.0	45.9	2.1	2.36	6.1
21	N-OB-2	J1R0X0	8/30/12	0.487	10.7	76.0	47.5	0.7	0.73	3.4
22	N-OB-3	J1R0X1	8/30/12	0.373	10.3	69.4	46.0	1.9	2.24	5.8
23	N-OB-4	J1R0X2	8/30/12	0.366	9.53	74.1	44.5	0.7	0.74	4.0
24	N-OB-5	J1R0X3	8/30/12	0.417	18.2	66.1	51.7	0.9	1.07	4.7
25	N-OB-6	J1R1P5	9/4/12	2.605	11.9	73.5	47.3	0.9	0.96	3.2
26	N-OB-7	J1R0X5	8/30/12	0.444	8.59	87.6	50.9	1.0	1.06	2.6
27	N-OB-8	J1R0X6	8/30/12	0.426	10.1	87.2	52.5	0.4	0.43	3.2
28	N-OB-9	J1R0X7	8/30/12	0.440	9.56	92.2	51.4	0.9	1.10	2.6
29	N-OB-11	J1R0X9	8/30/12	0.383	11.8	69.3	46.1	3.0	3.19	3.5
30	N-OB-12	J1R100	8/30/12	0.353	10.4	64.1	46.0	2.8	3.06	4.1

31 **Statistical Computations**

		Molybdenum	Nickel	Vanadium	Zinc	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
33	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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
34	N	12	12	12	12	12	12	12
35	% < Detection limit	8%	0%	0%	0%	0%	0%	0%
36	Mean	0.592	11.0	75.6	48.1	1.4	1.56	4.0
37	Standard deviation	0.635	2.45	8.92	2.76	0.9	0.94	1.2
38	95% UCL on mean	0.893	12.2	80.5	49.4	2.2	2.49	4.7
39	Maximum value	0.487	18.2	92.2	52.5	3.0	3.19	6.1
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection
41	**WAC 173-340 3-PART TEST**							
42	95% UCL > Cleanup Limit?	NO	NA	NO	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NO	NA	YES	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NO	NA	NO	NA	NA	NA	NA
45	**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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0

Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12

Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 18 of 35

1 **100-D-50:1 Maximum Calculations**

2 **Verification Data - North Overburden**

3	Sample	Sample	Sample	Chloride			Nitrite in nitrogen [a]			Diethyl phthalate		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
5	N-OB-10	J1R0X8	8/30/12	1.0	U	1.0	0.3	U	0.3	328	U	328
6	Duplicate of J1R0X8	J1R101	8/30/12	0.9	U	0.9	0.3	U	0.3	327	U	327
7	N-OB-1	J1R0W9	8/30/12	1.0	U	1.0	0.3	U	0.3	64.7	J	325
8	N-OB-2	J1R0X0	8/30/12	1.0	U	1.0	0.3	U	0.3	326	U	326
9	N-OB-3	J1R0X1	8/30/12	1.2	B	1.0	0.9	B	0.3	329	U	329
10	N-OB-4	J1R0X2	8/30/12	1.0	U	1.0	0.3	U	0.3	328	U	328
11	N-OB-5	J1R0X3	8/30/12	1.0	U	1.0	0.3	U	0.3	326	U	326
12	N-OB-6	J1R1P5	9/4/12	1.0	U	1.0	0.3	U	0.3	324	U	324
13	N-OB-7	J1R0X5	8/30/12	1.0	U	1.0	0.3	U	0.3	327	U	327
14	N-OB-8	J1R0X6	8/30/12	1.0	U	1.0	0.3	U	0.3	328	U	328
15	N-OB-9	J1R0X7	8/30/12	0.9	U	0.9	0.3	U	0.3	330	U	330
16	N-OB-11	J1R0X9	8/30/12	2.0	B	1.0	0.3	U	0.3	328	U	328
17	N-OB-12	J1R100	8/30/12	1.4	B	1.0	0.3	U	0.3	331	U	331

18 **Statistical Computations**

19		Chloride			Nitrite in nitrogen [a]			Diethyl phthalate		
20	% < Detection limit	75%			92%			92%		
21	Maximum value	2.0			0.9			64.7		
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	25000		GW Protection	100		GW Protection	1,280,000 ug/kg		GW Protection
23	**3-PART TEST**									
24	Maximum > Cleanup Limit?	NA			NO			NO		
25	> 10% above Cleanup Limit?	NA			NO			NO		
26	Any sample > 2X Cleanup Limit?	NA			NO			NO		
27	**3-Part Test Compliance?**	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.			The data set meets the 3 part test criteria when compared to the most stringent RAG.			The data set meets the 3-part test criteria when compared to the most stringent RAG.		

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 19 of 35

1 **100-D-50:1 Statistical Calculations**
2 **Verification Data - South Overburden**

3	Sample	Sample	Sample	Carbon-14			Cesium-137			Uranium-233/234 (AEA)			Uranium-238 (AEA)		
4	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
5	S-OB-1	J1R102	8/30/12	1.72		0.912	0.018	U	0.018	0.316		0.202	0.501		0.202
6	Duplicate of J1R102	J1R114	8/30/12	-1.13	U	0.924	0.026	U	0.026	0.502		0.384	0.301	U	0.384
7	S-OB-2	J1R103	8/30/12	2.00		1.14	0.123		0.045	0.562		0.204	0.214		0.204
8	S-OB-3	J1R104	8/30/12	1.94		0.958	0.023	U	0.023	0.658		0.187	0.683		0.187
9	S-OB-4	J1R105	8/30/12	2.11		0.978	0.022	U	0.022	0.522		0.235	0.430		0.235
10	S-OB-5	J1R106	8/30/12	1.99		1.47	0.018	U	0.018	0.585		0.224	0.439		0.224
11	S-OB-6	J1R107	8/30/12	1.39		0.846	0.026	U	0.026	0.517		0.188	0.566		0.188
12	S-OB-7	J1R108	8/30/12	1.10		0.954	0.026	U	0.026	0.622		0.207	0.594		0.207
13	S-OB-8	J1R109	8/30/12	-0.045	U	0.943	0.038	U	0.038	0.512		0.206	0.566		0.206
14	S-OB-9	J1R110	8/30/12	-0.542	U	0.896	0.019	U	0.019	0.817		0.184	0.481		0.184
15	S-OB-10	J1R111	8/30/12	-0.233	U	0.887	0.021	U	0.021	0.688		0.181	0.664		0.181
16	S-OB-11	J1R112	8/30/12	-0.671	U	0.900	0.027		0.018	0.588		0.196	0.409		0.196
17	S-OB-12	J1R113	8/30/12	-0.480	U	0.898	0.044		0.029	0.605		0.272	0.463		0.272

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Carbon-14			Cesium-137			Uranium-233/234 (AEA)			Uranium-238 (AEA)		
20	Area	Number	Date	pCi/g			pCi/g			pCi/g			pCi/g		
21	S-OB-1	J1R102/ J1R114	8/30/12	0.295			0.011			0.409			0.347		
22	S-OB-2	J1R103	8/30/12	2.00			0.123			0.562			0.214		
23	S-OB-3	J1R104	8/30/12	1.94			0.012			0.658			0.683		
24	S-OB-4	J1R105	8/30/12	2.11			0.011			0.522			0.430		
25	S-OB-5	J1R106	8/30/12	1.99			0.009			0.585			0.439		
26	S-OB-6	J1R107	8/30/12	1.39			0.013			0.517			0.566		
27	S-OB-7	J1R108	8/30/12	1.10			0.013			0.622			0.594		
28	S-OB-8	J1R109	8/30/12	-0.045			0.019			0.512			0.566		
29	S-OB-9	J1R110	8/30/12	-0.542			0.010			0.817			0.481		
30	S-OB-10	J1R111	8/30/12	-0.233			0.011			0.688			0.664		
31	S-OB-11	J1R112	8/30/12	-0.671			0.027			0.588			0.409		
32	S-OB-12	J1R113	8/30/12	-0.480			0.044			0.605			0.463		

33 **Statistical Computations**

34		Carbon-14			Cesium-137			Uranium-233/234 (AEA)			Uranium-238 (AEA)		
35	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.		
36	N	12			12			12			12		
37	% < Detection limit	42%			75%			0%			0%		
38	Mean	0.74			0.025			0.590			0.488		
39	Standard deviation	1.12			0.032			0.103			0.135		
40	Z-statistic	1.64			1.64			1.64			1.64		
41	95% UCL on mean	1.27			0.041			0.639			0.552		
42	Maximum value	2.11			0.123			0.817			0.683		

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

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 20 of 35

100-D-50:1 Statistical Calculations
Verification Data - South Overburden

1	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper			Lead			Manganese		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	S-OB-1	J1R102	8/30/12	3.04		0.950	66.5		0.475	0.316		0.190	2.66		1.90	0.109	B	0.190	9.29		0.190	7.42		1.90	15.9		0.950	4.15		0.475	373		4.75
4	Duplicate of J1R102	J1R114	8/30/12	3.02		0.949	65.0		0.474	0.312		0.190	1.34	B	1.90	0.108	B	0.190	9.59		0.190	7.95		1.90	15.8		0.949	4.73		0.474	347		4.74
5	S-OB-2	J1R103	8/30/12	3.14		0.967	85.3		0.484	0.315		0.193	2.97		1.93	0.131	B	0.193	10.5		0.193	7.35		1.93	15.8		0.967	5.47		0.484	362		4.84
6	S-OB-3	J1R104	8/30/12	2.51		1.00	59.5		0.500	0.284		0.200	1.55	B	2.00	0.111	B	0.200	8.20		0.200	6.73		2.00	14.2		1.00	3.85		0.500	332		5.00
7	S-OB-4	J1R105	8/30/12	3.83		0.936	70.3		0.468	0.332		0.187	1.43	B	1.87	0.124	B	0.187	11.3		0.187	8.96		1.87	17.8		0.936	4.34		0.468	391		4.68
8	S-OB-5	J1R106	8/30/12	2.39		0.967	63.7		0.483	0.319		0.193	1.32	B	1.93	0.108	B	0.193	9.70		0.193	7.67		1.93	16.0		0.967	3.62		0.483	367		4.83
9	S-OB-6	J1R107	8/30/12	2.78		0.985	69.4		0.492	0.296		0.197	1.90	B	1.97	0.115	B	0.197	9.62		0.197	7.36		1.97	15.3		0.985	4.01		0.492	359		4.92
10	S-OB-7	J1R108	8/30/12	2.86		1.00	69.3		0.501	0.306		0.201	1.28	B	2.01	0.102	B	0.201	8.78		0.201	8.22		2.01	15.6		1.00	3.82		0.501	371		5.01
11	S-OB-8	J1R109	8/30/12	2.19		0.899	56.4		0.449	0.267		0.180	0.878	B	1.80	0.0973	B	0.180	6.15		0.180	8.57		1.80	17.5		0.899	3.14		0.449	346		4.49
12	S-OB-9	J1R110	8/30/12	2.68		0.985	66.0		0.492	0.292		0.197	1.34	B	1.97	0.117	B	0.197	9.91		0.197	7.32		1.97	15.7		0.985	4.14		0.492	353		4.92
13	S-OB-10	J1R111	8/30/12	2.89		1.00	63.7		0.502	0.304		0.201	1.23	B	2.01	0.111	B	0.201	9.63		0.201	8.02		2.01	15.5		1.00	3.77		0.502	366		5.02
14	S-OB-11	J1R112	8/30/12	2.26		0.946	63.0		0.473	0.263		0.189	1.34	B	1.89	0.109	B	0.189	8.69		0.189	7.10		1.89	15.3		0.946	3.86		0.473	309		4.73
15	S-OB-12	J1R113	8/30/12	3.17		0.945	69.6		0.473	0.291		0.189	2.84		1.89	0.125	B	0.189	10.5		0.189	7.07		1.89	15.4		0.945	4.67		0.473	308		4.73

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	S-OB-1	J1R102/ J1R114	8/30/12	3.03	65.8	0.314	2.00	0.109	9.44	7.69	15.9	4.44	360
20	S-OB-2	J1R103	8/30/12	3.14	85.3	0.315	2.97	0.131	10.5	7.35	15.8	5.47	362
21	S-OB-3	J1R104	8/30/12	2.51	59.5	0.284	1.55	0.111	8.20	6.73	14.2	3.85	332
22	S-OB-4	J1R105	8/30/12	3.83	70.3	0.332	1.43	0.124	11.3	8.96	17.8	4.34	391
23	S-OB-5	J1R106	8/30/12	2.39	63.7	0.319	1.32	0.108	9.70	7.67	16.0	3.62	367
24	S-OB-6	J1R107	8/30/12	2.78	69.4	0.296	1.90	0.115	9.62	7.36	15.3	4.01	359
25	S-OB-7	J1R108	8/30/12	2.86	69.3	0.306	1.28	0.102	8.78	8.22	15.6	3.82	371
26	S-OB-8	J1R109	8/30/12	2.19	56.4	0.267	0.878	0.0973	6.15	8.57	17.5	3.14	346
27	S-OB-9	J1R110	8/30/12	2.68	66.0	0.292	1.34	0.117	9.91	7.32	15.7	4.14	353
28	S-OB-10	J1R111	8/30/12	2.89	63.7	0.304	1.23	0.111	9.63	8.02	15.5	3.77	366
29	S-OB-11	J1R112	8/30/12	2.26	63.0	0.263	1.34	0.109	8.69	7.10	15.3	3.86	309
30	S-OB-12	J1R113	8/30/12	3.17	69.6	0.291	2.84	0.125	10.5	7.07	15.4	4.67	308

31 **Statistical Computations**

32		Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese
33	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), 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.
34	N	12	12	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
36	Mean	2.81	66.8	0.299	1.67	0.113	9.37	7.67	15.8	4.09	352
37	Standard deviation	0.458	7.21	0.0207	0.647	0.0097	1.33	0.66	0.967	0.591	24.7
38	95% UCL on mean	3.07	70.3	0.310	2.07	0.119	10.0	8.03	16.3	4.42	365
39	Maximum value	3.83	85.3	0.332	2.97	0.131	11.3	8.96	17.8	5.47	391
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	10.2 GW & River Protection	512 GW & River Protection
41	**WAC 173-340 3-PART TEST**										
42	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
43	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 21 of 35

100-D-50:1 Statistical Calculations
Verification Data - South Overburden

1	Sample	Sample	Sample	Molybdenum			Nickel			Vanadium			Zinc			Chloride			Nitrate as nitrogen [a]			Nitrogen in nitrate and nitrite			Sulfate		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	S-OB-1	J1R102	8/30/12	0.432	B	1.90	11.7		3.80	67.1		2.37	49.2		9.50	1.7	B	1.0	2.4		0.2	2.68		0.10	10.1		1.0
4	Duplicate of J1R102	J1R114	8/30/12	0.368	B	1.90	10.8		3.80	69.4		2.37	49.1		9.49	2.3	B	0.9	2.1		0.2	2.03		0.09	7.8		0.9
5	S-OB-2	J1R103	8/30/12	0.702	B	1.93	14.8		3.87	67.3		2.42	48.7		9.67	5.5		1.0	3.7		0.2	3.92		0.10	9.6		1.0
6	S-OB-3	J1R104	8/30/12	0.393	B	2.00	9.31		4.00	65.3		2.50	47.7		10.0	11.8		0.9	38.9	D	1.0	40.4	D	0.92	69.6		0.9
7	S-OB-4	J1R105	8/30/12	0.512	B	1.87	12.8		3.74	75.4		2.34	52.0		9.36	1.1	B	1.0	1.3		0.2	1.44		0.10	7.6		1.0
8	S-OB-5	J1R106	8/30/12	0.432	B	1.93	12.0		3.87	73.2		2.42	48.1		9.67	1.1	B	0.9	0.6	B	0.2	0.77		0.09	6.6		0.9
9	S-OB-6	J1R107	8/30/12	0.428	B	1.97	12.0		3.94	67.7		2.46	46.5		9.85	1.0	B	1.0	2.8		0.2	3.00		0.10	7.2		1.0
10	S-OB-7	J1R108	8/30/12	0.395	B	2.01	10.6		4.01	64.9		2.51	47.4		10.0	1.0	U	1.0	0.4	B	0.2	0.46	B	0.10	4.5	B	1.0
11	S-OB-8	J1R109	8/30/12	0.417	B	1.80	12.3		3.60	69.1		2.25	49.1		8.99	1.2	B	0.9	0.7	B	0.2	0.71		0.09	7.1		0.9
12	S-OB-9	J1R110	8/30/12	0.374	B	1.97	9.96		3.94	73.1		2.46	49.1		9.85	1.0	B	1.0	1.2		0.2	1.17		0.10	5.4		1.0
13	S-OB-10	J1R111	8/30/12	0.423	B	2.01	11.1		4.02	74.3		2.51	48.6		10.0	1.8	B	0.9	1.6		0.2	1.58		0.09	7.8		0.9
14	S-OB-11	J1R112	8/30/12	0.378	B	1.89	10.3		3.79	66.6		2.37	46.0		9.46	1.0	U	1.0	1.0	B	0.2	1.04		0.10	3.4	B	1.0
15	S-OB-12	J1R113	8/30/12	0.329	B	1.89	11.1		3.78	63.2		2.36	45.5		9.45	1.1	B	1.0	3.3		0.2	3.29		0.10	4.7	B	1.0

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Molybdenum	Nickel	Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	S-OB-1	J1R102/ J1R114	8/30/12	0.400	11.3	68.3	49.2	2.0	2.2	2.36	9.0
20	S-OB-2	J1R103	8/30/12	0.702	14.8	67.3	48.7	5.5	3.7	3.92	9.6
21	S-OB-3	J1R104	8/30/12	0.393	9.31	65.3	47.7	11.8	38.9	40.4	69.6
22	S-OB-4	J1R105	8/30/12	0.512	12.8	75.4	52.0	1.1	1.3	1.44	7.6
23	S-OB-5	J1R106	8/30/12	0.432	12.0	73.2	48.1	1.1	0.6	0.77	6.6
24	S-OB-6	J1R107	8/30/12	0.428	12.0	67.7	46.5	1.0	2.8	3.00	7.2
25	S-OB-7	J1R108	8/30/12	0.395	10.6	64.9	47.4	0.5	0.4	0.46	4.5
26	S-OB-8	J1R109	8/30/12	0.417	12.3	69.1	49.1	1.2	0.7	0.71	7.1
27	S-OB-9	J1R110	8/30/12	0.374	10.0	73.1	49.1	1.0	1.2	1.17	5.4
28	S-OB-10	J1R111	8/30/12	0.423	11.1	74.3	48.6	1.8	1.6	1.58	7.8
29	S-OB-11	J1R112	8/30/12	0.378	10.3	66.6	46.0	0.5	1.0	1.04	3.4
30	S-OB-12	J1R113	8/30/12	0.329	11.1	63.2	45.5	1.1	3.3	3.29	4.7

31 **Statistical Computations**

32		Molybdenum	Nickel	Vanadium	Zinc	Chloride	Nitrate as nitrogen [a]	Nitrogen in nitrate and nitrite	Sulfate
33	95% UCL based on	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), 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.
34	N	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	0%	0%	0%	17%	0%	0%	0%
36	Mean	0.432	11.5	69.0	48.2	2.4	4.8	5.01	11.9
37	Standard deviation	0.096	1.46	4.03	1.74	3.2	10.8	11.2	18.3
38	95% UCL on mean	0.477	12.3	71.2	49.1	3.9	9.9	10.3	20.5
39	Maximum value	0.702	14.8	75.4	52.0	11.8	38.9	40.4	69.6
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection
41	**WAC 173-340 3-PART TEST**								
42	95% UCL > Cleanup Limit?	NO	NA	NA	NA	NA	NO	NO	NA
43	> 10% above Cleanup Limit?	NO	NA	NA	NA	NA	NO	NO	NA
44	Any sample > 2X Cleanup Limit?	NO	NA	NA	NA	NA	NO	NO	NA
45	**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.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 22 of 35

1 **100-D-50:1 Maximum Calculations**

2 **Verification Data - South Overburden**

3	Sample	Sample	Sample	Mercury			Aroclor-1254			Aroclor-1260		
4	Area	Number	Date	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	S-OB-1	J1R102	8/30/12	0.0283	U	0.0283	13.4	U	13.4	13.4	U	13.4
6	Duplicate of J1R102	J1R114	8/30/12	0.0266	U	0.0266	13.3	U	13.3	13.3	U	13.3
7	S-OB-2	J1R103	8/30/12	0.0308		0.0292	3.46	J	13.1	3.89	J	13.1
8	S-OB-3	J1R104	8/30/12	0.0287	U	0.0287	13.4	U	13.4	13.4	U	13.4
9	S-OB-4	J1R105	8/30/12	0.0293	U	0.0293	13.3	U	13.3	13.3	U	13.3
10	S-OB-5	J1R106	8/30/12	0.0274	U	0.0274	13.3	U	13.3	13.3	U	13.3
11	S-OB-6	J1R107	8/30/12	0.0283	U	0.0283	13.3	U	13.3	13.3	U	13.3
12	S-OB-7	J1R108	8/30/12	0.0282	U	0.0282	13.1	U	13.1	13.1	U	13.1
13	S-OB-8	J1R109	8/30/12	0.0283	U	0.0283	13.3	U	13.3	13.3	U	13.3
14	S-OB-9	J1R110	8/30/12	0.0283	U	0.0283	13.4	U	13.4	13.4	U	13.4
15	S-OB-10	J1R111	8/30/12	0.0274	U	0.0274	13.0	U	13.0	13.0	U	13.0
16	S-OB-11	J1R112	8/30/12	0.0274	U	0.0274	13.2	U	13.2	13.2	U	13.2
17	S-OB-12	J1R113	8/30/12	0.0273	U	0.0273	13.3	U	13.3	13.3	U	13.3

18 **Statistical Computations**

19		Mercury			Aroclor-1254			Aroclor-1260		
20	% < Detection limit	92%			92%			92%		
21	Maximum value	0.0308			3.46			3.89		
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	0.33	GW and River Protection		17 ug/kg	GW and River Protection		17 ug/kg	GW and River Protection	
23	**3-PART TEST**									
24	Maximum > Cleanup Limit?	NA			NO			NO		
25	> 10% above Cleanup Limit?	NA			NO			NO		
26	Any sample > 2X Cleanup Limit?	NA			NO			NO		
27	**3-Part Test Compliance?**	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.		

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 23 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite Excavation

Arsenic 95% UCL Calculation

DATA	ID
2.35	J1R0V0/ J1R0V5
2.50	J1R0T2
2.70	J1R0T3
2.38	J1R0T4
2.56	J1R0T5
3.04	J1R0T6
2.93	J1R0T7
2.74	J1R0T8
2.64	J1R0T9
2.71	J1R0V1
2.32	J1R0V2
3.02	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	2.66
Censored		Lognormal mean	2.66
Detection limit or PQL		Std. devn.	0.25
Method detection limit		Median	2.67
TOTAL	12	Min.	2.32
		Max.	3.04

Lognormal distribution? r-squared is: 0.960
Normal distribution? r-squared is: 0.957
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.79

Barium 95% UCL Calculation

DATA	ID
68.9	J1R0V0/ J1R0V5
74.9	J1R0T2
70.7	J1R0T3
60.0	J1R0T4
82.6	J1R0T5
78.6	J1R0T6
81.7	J1R0T7
80.6	J1R0T8
82.4	J1R0T9
80.7	J1R0V1
68.8	J1R0V2
62.0	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	74.3
Censored		Lognormal mean	74.4
Detection limit or PQL		Std. devn.	8.08
Method detection limit		Median	76.8
TOTAL	12	Min.	60.0
		Max.	82.6

Lognormal distribution? r-squared is: 0.887
Normal distribution? r-squared is: 0.897
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 78.2

Beryllium 95% UCL Calculation

DATA	ID
0.251	J1R0V0/ J1R0V5
0.308	J1R0T2
0.289	J1R0T3
0.254	J1R0T4
0.323	J1R0T5
0.335	J1R0T6
0.352	J1R0T7
0.332	J1R0T8
0.311	J1R0T9
0.322	J1R0V1
0.281	J1R0V2
0.266	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	0.302
Censored		Lognormal mean	0.302
Detection limit or PQL		Std. devn.	0.033
Method detection limit		Median	0.310
TOTAL	12	Min.	0.251
		Max.	0.352

Lognormal distribution? r-squared is: 0.950
Normal distribution? r-squared is: 0.960
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.321

Boron 95% UCL Calculation

DATA	ID
2.47	J1R0V0/ J1R0V5
1.44	J1R0T2
1.38	J1R0T3
2.60	J1R0T4
1.45	J1R0T5
1.49	J1R0T6
1.61	J1R0T7
1.44	J1R0T8
1.39	J1R0T9
1.55	J1R0V1
2.43	J1R0V2
2.70	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	1.83
Censored		Lognormal mean	1.83
Detection limit or PQL		Std. devn.	0.54
Method detection limit		Median	1.52
TOTAL	12	Min.	1.38
		Max.	2.70

Lognormal distribution? r-squared is: 0.779
Normal distribution? r-squared is: 0.761
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.08

Chromium 95% UCL Calculation

DATA	ID
8.52	J1R0V0/ J1R0V5
9.09	J1R0T2
9.42	J1R0T3
8.61	J1R0T4
8.98	J1R0T5
10.3	J1R0T6
10.4	J1R0T7
8.96	J1R0T8
10.0	J1R0T9
10.1	J1R0V1
7.11	J1R0V2
9.13	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	9.22
Censored		Lognormal mean	9.22
Detection limit or PQL		Std. devn.	0.93
Method detection limit		Median	9.11
TOTAL	12	Min.	7.11
		Max.	10.4

Lognormal distribution? r-squared is: 0.887
Normal distribution? r-squared is: 0.916
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 9.70

Cobalt 95% UCL Calculation

DATA	ID
7.43	J1R0V0/ J1R0V5
7.97	J1R0T2
8.45	J1R0T3
8.51	J1R0T4
8.67	J1R0T5
7.97	J1R0T6
7.80	J1R0T7
8.21	J1R0T8
7.98	J1R0T9
8.31	J1R0V1
8.32	J1R0V2
7.13	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	8.06
Censored		Lognormal mean	8.06
Detection limit or PQL		Std. devn.	0.45
Method detection limit		Median	8.10
TOTAL	12	Min.	7.13
		Max.	8.67

Lognormal distribution? r-squared is: 0.928
Normal distribution? r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.31

Copper 95% UCL Calculation

DATA	ID
12.8	J1R0V0/ J1R0V5
14.4	J1R0T2
14.8	J1R0T3
14.6	J1R0T4
15.3	J1R0T5
14.1	J1R0T6
14.1	J1R0T7
13.8	J1R0T8
13.5	J1R0T9
14.3	J1R0V1
14.7	J1R0V2
13.6	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	14.2
Censored		Lognormal mean	14.2
Detection limit or PQL		Std. devn.	0.67
Method detection limit		Median	14.2
TOTAL	12	Min.	12.8
		Max.	15.3

Lognormal distribution? r-squared is: 0.970
Normal distribution? r-squared is: 0.977
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.5

Lead 95% UCL Calculation

DATA	ID
3.36	J1R0V0/ J1R0V5
3.96	J1R0T2
3.91	J1R0T3
3.30	J1R0T4
4.74	J1R0T5
4.64	J1R0T6
4.40	J1R0T7
4.44	J1R0T8
4.11	J1R0T9
4.34	J1R0V1
3.62	J1R0V2
3.79	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	4.05
Censored		Lognormal mean	4.05
Detection limit or PQL		Std. devn.	0.48
Method detection limit		Median	4.04
TOTAL	12	Min.	3.30
		Max.	4.74

Lognormal distribution? r-squared is: 0.965
Normal distribution? r-squared is: 0.973
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.32

Manganese 95% UCL Calculation

DATA	ID
322	J1R0V0/ J1R0V5
375	J1R0T2
366	J1R0T3
329	J1R0T4
355	J1R0T5
339	J1R0T6
341	J1R0T7
360	J1R0T8
347	J1R0T9
359	J1R0V1
345	J1R0V2
312	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	346
Censored		Lognormal mean	346
Detection limit or PQL		Std. devn.	18.6
Method detection limit		Median	346
TOTAL	12	Min.	312
		Max.	375

Lognormal distribution? r-squared is: 0.980
Normal distribution? r-squared is: 0.985
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 356

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 24 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite Excavation

Nickel 95% UCL Calculation

DATA	ID
9.61	J1R0V0/ J1R0V5
10.2	J1R0T2
9.85	J1R0T3
9.04	J1R0T4
9.91	J1R0T5
10.2	J1R0T6
10.3	J1R0T7
10.1	J1R0T8
11.9	J1R0T9
10.5	J1R0V1
8.83	J1R0V2
9.24	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	9.97
Censored		Lognormal mean	9.98
Detection limit or PQL		Std. devn.	0.80
Method detection limit		Median	10.0
TOTAL	12	Min.	8.83
		Max.	11.9

Lognormal distribution? r-squared is: 0.921
Normal distribution? r-squared is: 0.900
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.4

Vanadium 95% UCL Calculation

DATA	ID
63.5	J1R0V0/ J1R0V5
68.5	J1R0T2
66.1	J1R0T3
70.1	J1R0T4
66.1	J1R0T5
65.4	J1R0T6
62.4	J1R0T7
64.6	J1R0T8
66.7	J1R0T9
69.4	J1R0V1
72.3	J1R0V2
56.9	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	66.0
Censored		Lognormal mean	66.0
Detection limit or PQL		Std. devn.	4.04
Method detection limit		Median	66.1
TOTAL	12	Min.	56.9
		Max.	72.3

Lognormal distribution? r-squared is: 0.930
Normal distribution? r-squared is: 0.947
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 68.2

Zinc 95% UCL Calculation

DATA	ID
39.9	J1R0V0/ J1R0V5
46.1	J1R0T2
45.8	J1R0T3
43.8	J1R0T4
45.3	J1R0T5
44.5	J1R0T6
44.3	J1R0T7
45.1	J1R0T8
44.8	J1R0T9
47.2	J1R0V1
46.4	J1R0V2
40.2	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	44.5
Censored		Lognormal mean	44.5
Detection limit or PQL		Std. devn.	2.26
Method detection limit		Median	45.0
TOTAL	12	Min.	39.9
		Max.	47.2

Lognormal distribution? r-squared is: 0.833
Normal distribution? r-squared is: 0.850
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 45.5

Chloride 95% UCL Calculation

DATA	ID
1.1	J1R0V0/ J1R0V5
1.2	J1R0T2
1.2	J1R0T3
0.5	J1R0T4
1.1	J1R0T5
1.0	J1R0T6
1.2	J1R0T7
1.5	J1R0T8
1.0	J1R0T9
1.1	J1R0V1
1.7	J1R0V2
2.2	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	1.2
Censored		Lognormal mean	1.2
Detection limit or PQL		Std. devn.	0.4
Method detection limit		Median	1.2
TOTAL	12	Min.	0.5
		Max.	2.2

Lognormal distribution? r-squared is: 0.862
Normal distribution? r-squared is: 0.867
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.4

Nitrate as nitrogen [a] 95% UCL Calculation

DATA	ID
1.9	J1R0V0/ J1R0V5
1.8	J1R0T2
1.3	J1R0T3
0.6	J1R0T4
1.6	J1R0T5
1.0	J1R0T6
0.5	J1R0T7
1.4	J1R0T8
0.6	J1R0T9
0.9	J1R0V1
1.3	J1R0V2
3.2	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	1.3
Censored		Lognormal mean	1.4
Detection limit or PQL		Std. devn.	0.7
Method detection limit		Median	1.3
TOTAL	12	Min.	0.5
		Max.	3.2

Lognormal distribution? r-squared is: 0.974
Normal distribution? r-squared is: 0.884
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.0

Nitrogen in nitrate and nitrite 95% UCL Calculation

DATA	ID
1.79	J1R0V0/ J1R0V5
1.79	J1R0T2
1.39	J1R0T3
0.65	J1R0T4
1.69	J1R0T5
1.19	J1R0T6
0.55	J1R0T7
1.40	J1R0T8
0.68	J1R0T9
0.88	J1R0V1
1.30	J1R0V2
3.14	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	1.37
Censored		Lognormal mean	1.39
Detection limit or PQL		Std. devn.	0.71
Method detection limit		Median	1.35
TOTAL	12	Min.	0.55
		Max.	3.14

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.870
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.93

Sulfate 95% UCL Calculation

DATA	ID
9.3	J1R0V0/ J1R0V5
10.2	J1R0T2
12.0	J1R0T3
5.7	J1R0T4
8.4	J1R0T5
6.1	J1R0T6
6.2	J1R0T7
14.7	J1R0T8
13.7	J1R0T9
7.1	J1R0V1
12.1	J1R0V2
16.8	J1R0V3

Number of samples		Uncensored values	
Uncensored	12	Mean	10.2
Censored		Lognormal mean	10.3
Detection limit or PQL		Std. devn.	3.7
Method detection limit		Median	9.7
TOTAL	12	Min.	5.7
		Max.	16.8

Lognormal distribution? r-squared is: 0.961
Normal distribution? r-squared is: 0.955
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.8

Acronyms and qualifiers are defined on sheet 3.
[a] Nitrate has been converted to nitrogen as nitrate

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 25 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite Staging Pile Area

Arsenic 95% UCL Calculation

DATA	ID
2.90	J1R0W2/ J1R0W8
2.23	J1R0V6
2.72	J1R0V7
2.92	J1R0V8
2.60	J1R0V9
3.13	J1R0W0
2.51	J1R0W1
4.04	J1R0W3
2.55	J1R0W4
3.37	J1R0W5
2.81	J1R0W6
2.83	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	2.88
Censored		Lognormal mean	2.89
Detection limit or PQL		Std. devn.	0.47
Method detection limit		Median	2.82
TOTAL	12	Min.	2.23
		Max.	4.04

Lognormal distribution? r-squared is: 0.933
Normal distribution? r-squared is: 0.885
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.14

Barium 95% UCL Calculation

DATA	ID
76.5	J1R0W2/ J1R0W8
64.7	J1R0V6
61.9	J1R0V7
61.6	J1R0V8
65.3	J1R0V9
66.0	J1R0W0
59.8	J1R0W1
66.9	J1R0W3
61.8	J1R0W4
82.2	J1R0W5
60.9	J1R0W6
61.4	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	65.8
Censored		Lognormal mean	65.8
Detection limit or PQL		Std. devn.	6.84
Method detection limit		Median	63.3
TOTAL	12	Min.	59.8
		Max.	82.2

Lognormal distribution? r-squared is: 0.787
Normal distribution? r-squared is: 0.759
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 69.0

Beryllium 95% UCL Calculation

DATA	ID
0.282	J1R0W2/ J1R0W8
0.266	J1R0V6
0.267	J1R0V7
0.268	J1R0V8
0.274	J1R0V9
0.245	J1R0W0
0.264	J1R0W1
0.268	J1R0W3
0.269	J1R0W4
0.342	J1R0W5
0.241	J1R0W6
0.268	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	0.271
Censored		Lognormal mean	0.271
Detection limit or PQL		Std. devn.	0.025
Method detection limit		Median	0.268
TOTAL	12	Min.	0.241
		Max.	0.342

Lognormal distribution? r-squared is: 0.727
Normal distribution? r-squared is: 0.687
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.283

Boron 95% UCL Calculation

DATA	ID
2.55	J1R0W2/ J1R0W8
1.50	J1R0V6
1.71	J1R0V7
1.74	J1R0V8
2.46	J1R0V9
1.67	J1R0W0
1.37	J1R0W1
1.86	J1R0W3
2.57	J1R0W4
2.04	J1R0W5
2.49	J1R0W6
1.59	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	1.96
Censored		Lognormal mean	1.97
Detection limit or PQL		Std. devn.	0.44
Method detection limit		Median	1.80
TOTAL	12	Min.	1.37
		Max.	2.57

Lognormal distribution? r-squared is: 0.924
Normal distribution? r-squared is: 0.902
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.23

Chromium 95% UCL Calculation

DATA	ID
9.68	J1R0W2/ J1R0W8
9.14	J1R0V6
10.2	J1R0V7
10.2	J1R0V8
9.27	J1R0V9
8.06	J1R0W0
8.66	J1R0W1
10.1	J1R0W3
8.49	J1R0W4
13.2	J1R0W5
9.08	J1R0W6
10.3	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	9.70
Censored		Lognormal mean	9.70
Detection limit or PQL		Std. devn.	1.33
Method detection limit		Median	9.47
TOTAL	12	Min.	8.06
		Max.	13.2

Lognormal distribution? r-squared is: 0.882
Normal distribution? r-squared is: 0.827
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 10.3

Cobalt 95% UCL Calculation

DATA	ID
7.71	J1R0W2/ J1R0W8
7.86	J1R0V6
7.72	J1R0V7
7.07	J1R0V8
7.96	J1R0V9
7.98	J1R0W0
7.47	J1R0W1
7.33	J1R0W3
8.02	J1R0W4
7.57	J1R0W5
7.76	J1R0W6
7.92	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	7.70
Censored		Lognormal mean	7.70
Detection limit or PQL		Std. devn.	0.29
Method detection limit		Median	7.74
TOTAL	12	Min.	7.07
		Max.	8.02

Lognormal distribution? r-squared is: 0.911
Normal distribution? r-squared is: 0.919
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.85

Copper 95% UCL Calculation

DATA	ID
15.9	J1R0W2/ J1R0W8
14.2	J1R0V6
14.5	J1R0V7
14.5	J1R0V8
16.6	J1R0V9
16.9	J1R0W0
13.8	J1R0W1
16.8	J1R0W3
14.4	J1R0W4
14.6	J1R0W5
14.7	J1R0W6
15.3	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	15.2
Censored		Lognormal mean	15.2
Detection limit or PQL		Std. devn.	1.09
Method detection limit		Median	14.7
TOTAL	12	Min.	13.8
		Max.	16.9

Lognormal distribution? r-squared is: 0.897
Normal distribution? r-squared is: 0.889
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 15.7

Lead 95% UCL Calculation

DATA	ID
8.78	J1R0W2/ J1R0W8
4.75	J1R0V6
4.53	J1R0V7
4.63	J1R0V8
6.77	J1R0V9
5.41	J1R0W0
3.73	J1R0W1
8.81	J1R0W3
4.07	J1R0W4
4.70	J1R0W5
3.92	J1R0W6
4.03	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	5.34
Censored		Lognormal mean	5.35
Detection limit or PQL		Std. devn.	1.80
Method detection limit		Median	4.67
TOTAL	12	Min.	3.73
		Max.	8.81

Lognormal distribution? r-squared is: 0.854
Normal distribution? r-squared is: 0.788
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 6.20

Manganese 95% UCL Calculation

DATA	ID
334	J1R0W2/ J1R0W8
362	J1R0V6
318	J1R0V7
301	J1R0V8
339	J1R0V9
314	J1R0W0
306	J1R0W1
312	J1R0W3
348	J1R0W4
359	J1R0W5
311	J1R0W6
322	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	327
Censored		Lognormal mean	327
Detection limit or PQL		Std. devn.	20.8
Method detection limit		Median	320
TOTAL	12	Min.	301
		Max.	362

Lognormal distribution? r-squared is: 0.939
Normal distribution? r-squared is: 0.932
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 338

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 26 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite Staging Pile Area

Nickel 95% UCL Calculation

DATA	ID
10.4	J1R0W2/ J1R0W8
10.5	J1R0V6
10.1	J1R0V7
10.9	J1R0V8
9.84	J1R0V9
10.2	J1R0W0
9.45	J1R0W1
9.84	J1R0W3
9.58	J1R0W4
11.5	J1R0W5
10.2	J1R0W6
11.1	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	10.3
Censored		Lognormal mean	10.3
Detection limit or PQL		Std. devn.	0.62
Method detection limit		Median	10.2
TOTAL	12	Min.	9.45
		Max.	11.5

Lognormal distribution? r-squared is: 0.973
Normal distribution? r-squared is: 0.965
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.6

Vanadium 95% UCL Calculation

DATA	ID
60.2	J1R0W2/ J1R0W8
70.7	J1R0V6
64.4	J1R0V7
56.8	J1R0V8
68.1	J1R0V9
55.2	J1R0W0
63.0	J1R0W1
55.3	J1R0W3
63.8	J1R0W4
56.3	J1R0W5
65.4	J1R0W6
64.5	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	62.0
Censored		Lognormal mean	62.0
Detection limit or PQL		Std. devn.	5.18
Method detection limit		Median	63.4
TOTAL	12	Min.	55.2
		Max.	70.7

Lognormal distribution? r-squared is: 0.938
Normal distribution? r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 64.8

Zinc 95% UCL Calculation

DATA	ID
46.0	J1R0W2/ J1R0W8
44.9	J1R0V6
43.1	J1R0V7
38.7	J1R0V8
52.9	J1R0V9
45.8	J1R0W0
41.0	J1R0W1
54.2	J1R0W3
42.9	J1R0W4
42.7	J1R0W5
41.6	J1R0W6
43.3	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	44.8
Censored		Lognormal mean	44.8
Detection limit or PQL		Std. devn.	4.59
Method detection limit		Median	43.2
TOTAL	12	Min.	38.7
		Max.	54.2

Lognormal distribution? r-squared is: 0.890
Normal distribution? r-squared is: 0.862
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 46.9

Chloride 95% UCL Calculation

DATA	ID
12.8	J1R0W2/ J1R0W8
1.4	J1R0V6
1.8	J1R0V7
1.9	J1R0V8
4.3	J1R0V9
17.8	J1R0W0
1.1	J1R0W1
7.8	J1R0W3
0.5	J1R0W4
3.0	J1R0W5
1.3	J1R0W6
2.6	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	4.7
Censored		Lognormal mean	4.8
Detection limit or PQL		Std. devn.	5.4
Method detection limit		Median	2.3
TOTAL	12	Min.	0.5
		Max.	17.8

Lognormal distribution? r-squared is: 0.964
Normal distribution? r-squared is: 0.735
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.6

Nitrate as nitrogen [a] 95% UCL Calculation

DATA	ID
42.1	J1R0W2/ J1R0W8
2.9	J1R0V6
6.0	J1R0V7
5.9	J1R0V8
12.4	J1R0V9
10.6	J1R0W0
2.1	J1R0W1
33.7	J1R0W3
2.7	J1R0W4
49.0	J1R0W5
5.1	J1R0W6
11.7	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	15.3
Censored		Lognormal mean	16.2
Detection limit or PQL		Std. devn.	16.5
Method detection limit		Median	8.3
TOTAL	12	Min.	2.1
		Max.	49.0

Lognormal distribution? r-squared is: 0.947
Normal distribution? r-squared is: 0.771
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 43.9

Nitrogen in nitrate and nitrite 95% UCL Calculation

DATA	ID
42.0	J1R0W2/ J1R0W8
3.03	J1R0V6
6.04	J1R0V7
6.11	J1R0V8
12.5	J1R0V9
10.7	J1R0W0
2.40	J1R0W1
31.5	J1R0W3
2.85	J1R0W4
47.7	J1R0W5
5.01	J1R0W6
12.0	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	15.2
Censored		Lognormal mean	15.8
Detection limit or PQL		Std. devn.	16.0
Method detection limit		Median	8.41
TOTAL	12	Min.	2.40
		Max.	47.7

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.774
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 40.3

Sulfate 95% UCL Calculation

DATA	ID
92.7	J1R0W2/ J1R0W8
9.4	J1R0V6
13.1	J1R0V7
12.8	J1R0V8
18.0	J1R0V9
21.1	J1R0W0
6.5	J1R0W1
93.2	J1R0W3
15.4	J1R0W4
32.5	J1R0W5
7.4	J1R0W6
12.1	J1R0W7

Number of samples		Uncensored values	
Uncensored	12	Mean	27.9
Censored		Lognormal mean	27.0
Detection limit or PQL		Std. devn.	31.2
Method detection limit		Median	14.3
TOTAL	12	Min.	6.5
		Max.	93.2

Lognormal distribution? r-squared is: 0.885
Normal distribution? r-squared is: 0.648
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 42.7

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 27 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite North Overburden

Arsenic 95% UCL Calculation

DATA	ID
2.56	J1R0X8/ J1R101
2.75	J1R0W9
2.21	J1R0X0
2.32	J1R0X1
2.32	J1R0X2
2.90	J1R0X3
2.63	J1R1P5
1.97	J1R0X5
1.90	J1R0X6
2.41	J1R0X7
2.79	J1R0X9
2.78	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	2.46
Censored		Lognormal mean	2.46
Detection limit or PQL		Std. devn.	0.33
Method detection limit		Median	2.48
TOTAL	12	Min.	1.90
		Max.	2.90

Lognormal distribution? r-squared is: 0.940
Normal distribution? r-squared is: 0.955
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.66

Barium 95% UCL Calculation

DATA	ID
68.1	J1R0X8/ J1R101
62.1	J1R0W9
78.4	J1R0X0
62.3	J1R0X1
60.1	J1R0X2
64.9	J1R0X3
60.9	J1R1P5
64.3	J1R0X5
55.3	J1R0X6
67.2	J1R0X7
78.0	J1R0X9
72.0	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	66.1
Censored		Lognormal mean	66.2
Detection limit or PQL		Std. devn.	7.06
Method detection limit		Median	64.6
TOTAL	12	Min.	55.3
		Max.	78.4

Lognormal distribution? r-squared is: 0.956
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 70.0

Beryllium 95% UCL Calculation

DATA	ID
0.283	J1R0X8/ J1R101
0.269	J1R0W9
0.262	J1R0X0
0.264	J1R0X1
0.245	J1R0X2
0.268	J1R0X3
0.289	J1R1P5
0.231	J1R0X5
0.242	J1R0X6
0.242	J1R0X7
0.305	J1R0X9
0.284	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	0.265
Censored		Lognormal mean	0.265
Detection limit or PQL		Std. devn.	0.022
Method detection limit		Median	0.266
TOTAL	12	Min.	0.231
		Max.	0.305

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

UCL (Land's method) is 0.278

Boron 95% UCL Calculation

DATA	ID
2.00	J1R0X8/ J1R101
1.20	J1R0W9
0.875	J1R0X0
1.28	J1R0X1
0.985	J1R0X2
1.32	J1R0X3
1.52	J1R1P5
0.951	J1R0X5
0.852	J1R0X6
1.14	J1R0X7
2.47	J1R0X9
2.54	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	1.43
Censored		Lognormal mean	1.43
Detection limit or PQL		Std. devn.	0.595
Method detection limit		Median	1.24
TOTAL	12	Min.	0.852
		Max.	2.54

Lognormal distribution? r-squared is: 0.923
Normal distribution? r-squared is: 0.852
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.80

Cadmium 95% UCL Calculation

DATA	ID
0.104	J1R0X8/ J1R101
0.0984	J1R0W9
0.0983	J1R0X0
0.111	J1R0X1
0.0977	J1R0X2
0.0972	J1R0X3
0.261	J1R1P5
0.0981	J1R0X5
0.111	J1R0X6
0.106	J1R0X7
0.121	J1R0X9
0.114	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	0.118
Censored		Lognormal mean	0.117
Detection limit or PQL		Std. devn.	0.0455
Method detection limit		Median	0.105
TOTAL	12	Min.	0.0972
		Max.	0.261

Lognormal distribution? r-squared is: 0.534
Normal distribution? r-squared is: 0.445
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.140

Chromium 95% UCL Calculation

DATA	ID
9.24	J1R0X8/ J1R101
8.85	J1R0W9
7.77	J1R0X0
8.94	J1R0X1
7.85	J1R0X2
10.6	J1R0X3
9.13	J1R1P5
5.75	J1R0X5
6.59	J1R0X6
6.31	J1R0X7
11.1	J1R0X9
9.49	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	8.47
Censored		Lognormal mean	8.49
Detection limit or PQL		Std. devn.	1.66
Method detection limit		Median	8.90
TOTAL	12	Min.	5.75
		Max.	11.1

Lognormal distribution? r-squared is: 0.949
Normal distribution? r-squared is: 0.966
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 9.52

Cobalt 95% UCL Calculation

DATA	ID
7.62	J1R0X8/ J1R101
7.33	J1R0W9
7.90	J1R0X0
6.95	J1R0X1
7.47	J1R0X2
6.97	J1R0X3
8.57	J1R1P5
8.54	J1R0X5
9.08	J1R0X6
8.03	J1R0X7
7.82	J1R0X9
7.99	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	7.86
Censored		Lognormal mean	7.86
Detection limit or PQL		Std. devn.	0.65
Method detection limit		Median	7.86
TOTAL	12	Min.	6.95
		Max.	9.08

Lognormal distribution? r-squared is: 0.975
Normal distribution? r-squared is: 0.970
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.21

Copper 95% UCL Calculation

DATA	ID
15.3	J1R0X8/ J1R101
15.7	J1R0W9
16.1	J1R0X0
13.6	J1R0X1
13.8	J1R0X2
15.6	J1R0X3
15.1	J1R1P5
14.2	J1R0X5
14.8	J1R0X6
15.6	J1R0X7
15.3	J1R0X9
15.2	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	15.0
Censored		Lognormal mean	15.0
Detection limit or PQL		Std. devn.	0.78
Method detection limit		Median	15.2
TOTAL	12	Min.	13.6
		Max.	16.1

Lognormal distribution? r-squared is: 0.913
Normal distribution? r-squared is: 0.922
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.5

Lead 95% UCL Calculation

DATA	ID
3.50	J1R0X8/ J1R101
3.75	J1R0W9
3.25	J1R0X0
4.05	J1R0X1
3.18	J1R0X2
3.45	J1R0X3
3.44	J1R1P5
2.99	J1R0X5
3.04	J1R0X6
3.08	J1R0X7
4.15	J1R0X9
3.91	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	3.48
Censored		Lognormal mean	3.48
Detection limit or PQL		Std. devn.	0.401
Method detection limit		Median	3.45
TOTAL	12	Min.	2.99
		Max.	4.15

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.944
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.70

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie	**Date** 10/24/12	**Calc. No.** 0100D-CA-V0482	**Rev. No.** 0
Project 100-D Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern NS	**Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations			**Sheet No.** 28 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite North Overburden

Manganese 95% UCL Calculation

DATA	ID
361	J1R0X8/ J1R101
343	J1R0W9
344	J1R0X0
302	J1R0X1
326	J1R0X2
315	J1R0X3
384	J1R1P5
362	J1R0X5
347	J1R0X6
379	J1R0X7
352	J1R0X9
353	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	347
Censored		Lognormal mean	347
Detection limit or PQL		Std. devn.	24.1
Method detection limit		Median	350
TOTAL	12	Min.	302
		Max.	384

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.966
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 361

Molybdenum 95% UCL Calculation

DATA	ID
0.368	J1R0X8/ J1R101
0.438	J1R0W9
0.487	J1R0X0
0.373	J1R0X1
0.366	J1R0X2
0.417	J1R0X3
2.61	J1R1P5
0.444	J1R0X5
0.426	J1R0X6
0.440	J1R0X7
0.383	J1R0X9
0.353	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	0.592
Censored		Lognormal mean	0.551
Detection limit or PQL		Std. devn.	0.635
Method detection limit		Median	0.422
TOTAL	12	Min.	0.353
		Max.	2.61

Lognormal distribution? r-squared is: 0.464
Normal distribution? r-squared is: 0.353
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.893

Nickel 95% UCL Calculation

DATA	ID
10.1	J1R0X8/ J1R101
10.7	J1R0W9
10.7	J1R0X0
10.3	J1R0X1
9.53	J1R0X2
18.2	J1R0X3
11.9	J1R1P5
8.59	J1R0X5
10.1	J1R0X6
9.56	J1R0X7
11.8	J1R0X9
10.4	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	11.0
Censored		Lognormal mean	11.0
Detection limit or PQL		Std. devn.	2.45
Method detection limit		Median	10.4
TOTAL	12	Min.	8.59
		Max.	18.2

Lognormal distribution? r-squared is: 0.752
Normal distribution? r-squared is: 0.655
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.2

Vanadium 95% UCL Calculation

DATA	ID
75.9	J1R0X8/ J1R101
72.0	J1R0W9
76.0	J1R0X0
69.4	J1R0X1
74.1	J1R0X2
66.1	J1R0X3
73.5	J1R1P5
87.6	J1R0X5
87.2	J1R0X6
92.2	J1R0X7
69.3	J1R0X9
64.1	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	75.6
Censored		Lognormal mean	75.7
Detection limit or PQL		Std. devn.	8.92
Method detection limit		Median	73.8
TOTAL	12	Min.	64.1
		Max.	92.2

Lognormal distribution? r-squared is: 0.934
Normal distribution? r-squared is: 0.915
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 80.5

Zinc 95% UCL Calculation

DATA	ID
47.2	J1R0X8/ J1R101
45.9	J1R0W9
47.5	J1R0X0
46.0	J1R0X1
44.5	J1R0X2
51.7	J1R0X3
47.3	J1R1P5
50.9	J1R0X5
52.5	J1R0X6
51.4	J1R0X7
46.1	J1R0X9
46.0	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	48.1
Censored		Lognormal mean	48.1
Detection limit or PQL		Std. devn.	2.76
Method detection limit		Median	47.2
TOTAL	12	Min.	44.5
		Max.	52.5

Lognormal distribution? r-squared is: 0.883
Normal distribution? r-squared is: 0.877
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 49.4

Nitrate as nitrogen [a] 95% UCL Calculation

DATA	ID
1.6	J1R0X8/ J1R101
2.1	J1R0W9
0.7	J1R0X0
1.9	J1R0X1
0.7	J1R0X2
0.9	J1R0X3
0.9	J1R1P5
1.0	J1R0X5
0.4	J1R0X6
0.9	J1R0X7
3.0	J1R0X9
2.8	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	1.4
Censored		Lognormal mean	1.4
Detection limit or PQL		Std. devn.	0.9
Method detection limit		Median	1.0
TOTAL	12	Min.	0.4
		Max.	3.0

Lognormal distribution? r-squared is: 0.961
Normal distribution? r-squared is: 0.893
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.2

Nitrogen in Nitrate and nitrite 95% UCL Calculation

DATA	ID
1.82	J1R0X8/ J1R101
2.36	J1R0W9
0.73	J1R0X0
2.24	J1R0X1
0.74	J1R0X2
1.07	J1R0X3
0.96	J1R1P5
1.06	J1R0X5
0.43	J1R0X6
1.10	J1R0X7
3.19	J1R0X9
3.06	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	1.56
Censored		Lognormal mean	1.60
Detection limit or PQL		Std. devn.	0.94
Method detection limit		Median	1.09
TOTAL	12	Min.	0.43
		Max.	3.19

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.899
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.49

Sulfate 95% UCL Calculation

DATA	ID
4.8	J1R0X8/ J1R101
6.1	J1R0W9
3.4	J1R0X0
5.8	J1R0X1
4.0	J1R0X2
4.7	J1R0X3
3.2	J1R1P5
2.6	J1R0X5
3.2	J1R0X6
2.6	J1R0X7
3.5	J1R0X9
4.1	J1R100

Number of samples		Uncensored values	
Uncensored	12	Mean	4.0
Censored		Lognormal mean	4.0
Detection limit or PQL		Std. devn.	1.2
Method detection limit		Median	3.8
TOTAL	12	Min.	2.6
		Max.	6.1

Lognormal distribution? r-squared is: 0.965
Normal distribution? r-squared is: 0.938
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.7

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 29 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite South Overburden

Arsenic 95% UCL Calculation

DATA	ID
3.03	J1R102/ J1R114
3.14	J1R103
2.51	J1R104
3.83	J1R105
2.39	J1R106
2.78	J1R107
2.86	J1R108
2.19	J1R109
2.68	J1R110
2.89	J1R111
2.26	J1R112
3.17	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	2.81
Censored		Lognormal mean	2.81
Detection limit or PQL		Std. devn.	0.46
Method detection limit		Median	2.82
TOTAL	12	Min.	2.19
		Max.	3.83

Lognormal distribution? r-squared is: 0.970
Normal distribution? r-squared is: 0.946
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.07

Barium 95% UCL Calculation

DATA	ID
65.8	J1R102/ J1R114
85.3	J1R103
59.5	J1R104
70.3	J1R105
63.7	J1R106
69.4	J1R107
69.3	J1R108
56.4	J1R109
66.0	J1R110
63.7	J1R111
63.0	J1R112
69.6	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	66.8
Censored		Lognormal mean	66.8
Detection limit or PQL		Std. devn.	7.21
Method detection limit		Median	65.9
TOTAL	12	Min.	56.4
		Max.	85.3

Lognormal distribution? r-squared is: 0.890
Normal distribution? r-squared is: 0.851
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 70.3

Beryllium 95% UCL Calculation

DATA	ID
0.314	J1R102/ J1R114
0.315	J1R103
0.284	J1R104
0.332	J1R105
0.319	J1R106
0.296	J1R107
0.306	J1R108
0.267	J1R109
0.292	J1R110
0.304	J1R111
0.263	J1R112
0.291	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	0.299
Censored		Lognormal mean	0.299
Detection limit or PQL		Std. devn.	0.0207
Method detection limit		Median	0.300
TOTAL	12	Min.	0.263
		Max.	0.332

Lognormal distribution? r-squared is: 0.966
Normal distribution? r-squared is: 0.974
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.310

Boron 95% UCL Calculation

DATA	ID
2.00	J1R102/ J1R114
2.97	J1R103
1.55	J1R104
1.43	J1R105
1.32	J1R106
1.90	J1R107
1.28	J1R108
0.878	J1R109
1.34	J1R110
1.23	J1R111
1.34	J1R112
2.84	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	1.67
Censored		Lognormal mean	1.68
Detection limit or PQL		Std. devn.	0.647
Method detection limit		Median	1.39
TOTAL	12	Min.	0.878
		Max.	2.97

Lognormal distribution? r-squared is: 0.912
Normal distribution? r-squared is: 0.837
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.07

Cadmium 95% UCL Calculation

DATA	ID
0.109	J1R102/ J1R114
0.131	J1R103
0.111	J1R104
0.124	J1R105
0.108	J1R106
0.115	J1R107
0.102	J1R108
0.0973	J1R109
0.117	J1R110
0.111	J1R111
0.109	J1R112
0.125	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	0.113
Censored		Lognormal mean	0.113
Detection limit or PQL		Std. devn.	0.0097
Method detection limit		Median	0.111
TOTAL	12	Min.	0.0973
		Max.	0.131

Lognormal distribution? r-squared is: 0.971
Normal distribution? r-squared is: 0.966
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.119

Chromium 95% UCL Calculation

DATA	ID
9.44	J1R102/ J1R114
10.5	J1R103
8.20	J1R104
11.3	J1R105
9.70	J1R106
9.62	J1R107
8.78	J1R108
6.15	J1R109
9.91	J1R110
9.63	J1R111
8.69	J1R112
10.5	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	9.37
Censored		Lognormal mean	9.39
Detection limit or PQL		Std. devn.	1.33
Method detection limit		Median	9.63
TOTAL	12	Min.	6.15
		Max.	11.3

Lognormal distribution? r-squared is: 0.835
Normal distribution? r-squared is: 0.898
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 10.0

Cobalt 95% UCL Calculation

DATA	ID
7.69	J1R102/ J1R114
7.35	J1R103
6.73	J1R104
8.96	J1R105
7.67	J1R106
7.36	J1R107
8.22	J1R108
8.57	J1R109
7.32	J1R110
8.02	J1R111
7.10	J1R112
7.07	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	7.67
Censored		Lognormal mean	7.67
Detection limit or PQL		Std. devn.	0.66
Method detection limit		Median	7.52
TOTAL	12	Min.	6.73
		Max.	8.96

Lognormal distribution? r-squared is: 0.966
Normal distribution? r-squared is: 0.954
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.03

Copper 95% UCL Calculation

DATA	ID
15.9	J1R102/ J1R114
15.8	J1R103
14.2	J1R104
17.8	J1R105
16.0	J1R106
15.3	J1R107
15.6	J1R108
17.5	J1R109
15.7	J1R110
15.5	J1R111
15.3	J1R112
15.4	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	15.8
Censored		Lognormal mean	15.8
Detection limit or PQL		Std. devn.	0.97
Method detection limit		Median	15.7
TOTAL	12	Min.	14.2
		Max.	17.8

Lognormal distribution? r-squared is: 0.852
Normal distribution? r-squared is: 0.840
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 16.3

Lead 95% UCL Calculation

DATA	ID
4.44	J1R102/ J1R114
5.47	J1R103
3.85	J1R104
4.34	J1R105
3.62	J1R106
4.01	J1R107
3.82	J1R108
3.14	J1R109
4.14	J1R110
3.77	J1R111
3.86	J1R112
4.67	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	4.09
Censored		Lognormal mean	4.10
Detection limit or PQL		Std. devn.	0.59
Method detection limit		Median	3.94
TOTAL	12	Min.	3.14
		Max.	5.47

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.916
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.42

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0

Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12

Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 30 of 35

Ecology Software (MTCAStat) Results, 100-D-50:1 Subsite South Overburden

Manganese 95% UCL Calculation

DATA	ID
360	J1R102/ J1R114
362	J1R103
332	J1R104
391	J1R105
367	J1R106
359	J1R107
371	J1R108
346	J1R109
353	J1R110
366	J1R111
309	J1R112
308	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	352
Censored		Lognormal mean	352
Detection limit or PQL		Std. devn.	24.7
Method detection limit		Median	360
TOTAL	12	Min.	308
		Max.	391

Lognormal distribution? r-squared is: 0.896
Normal distribution? r-squared is: 0.911
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 365

Molybdenum 95% UCL Calculation

DATA	ID
0.400	J1R102/ J1R114
0.702	J1R103
0.393	J1R104
0.512	J1R105
0.432	J1R106
0.428	J1R107
0.395	J1R108
0.417	J1R109
0.374	J1R110
0.423	J1R111
0.378	J1R112
0.329	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	0.432
Censored		Lognormal mean	0.432
Detection limit or PQL		Std. devn.	0.0955
Method detection limit		Median	0.409
TOTAL	12	Min.	0.329
		Max.	0.702

Lognormal distribution? r-squared is: 0.794
Normal distribution? r-squared is: 0.704
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.477

Nickel 95% UCL Calculation

DATA	ID
11.3	J1R102/ J1R114
14.8	J1R103
9.31	J1R104
12.8	J1R105
12.0	J1R106
12.0	J1R107
10.6	J1R108
12.3	J1R109
9.96	J1R110
11.1	J1R111
10.3	J1R112
11.1	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	11.5
Censored		Lognormal mean	11.5
Detection limit or PQL		Std. devn.	1.46
Method detection limit		Median	11.2
TOTAL	12	Min.	9.31
		Max.	14.8

Lognormal distribution? r-squared is: 0.967
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.3

Vanadium 95% UCL Calculation

DATA	ID
68.3	J1R102/ J1R114
67.3	J1R103
65.3	J1R104
75.4	J1R105
73.2	J1R106
67.7	J1R107
64.9	J1R108
69.1	J1R109
73.1	J1R110
74.3	J1R111
66.6	J1R112
63.2	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	69.0
Censored		Lognormal mean	69.0
Detection limit or PQL		Std. devn.	4.03
Method detection limit		Median	68.0
TOTAL	12	Min.	63.2
		Max.	75.4

Lognormal distribution? r-squared is: 0.948
Normal distribution? r-squared is: 0.943
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 71.2

Zinc 95% UCL Calculation

DATA	ID
49.2	J1R102/ J1R114
48.7	J1R103
47.7	J1R104
52.0	J1R105
48.1	J1R106
46.5	J1R107
47.4	J1R108
49.1	J1R109
49.1	J1R110
48.6	J1R111
46.0	J1R112
45.5	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	48.2
Censored		Lognormal mean	48.2
Detection limit or PQL		Std. devn.	1.74
Method detection limit		Median	48.4
TOTAL	12	Min.	45.5
		Max.	52.0

Lognormal distribution? r-squared is: 0.935
Normal distribution? r-squared is: 0.929
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 49.1

Chloride 95% UCL Calculation

DATA	ID
2.0	J1R102/ J1R114
5.5	J1R103
11.8	J1R104
1.1	J1R105
1.1	J1R106
1.0	J1R107
0.5	J1R108
1.2	J1R109
1.0	J1R110
1.8	J1R111
0.5	J1R112
1.1	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	2.4
Censored		Lognormal mean	2.2
Detection limit or PQL		Std. devn.	3.2
Method detection limit		Median	1.1
TOTAL	12	Min.	0.5
		Max.	11.8

Lognormal distribution? r-squared is: 0.846
Normal distribution? r-squared is: 0.558
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.9

Nitrate as nitrogen [a] 95% UCL Calculation

DATA	ID
2.2	J1R102/ J1R114
3.7	J1R103
38.9	J1R104
1.3	J1R105
0.6	J1R106
2.8	J1R107
0.4	J1R108
0.7	J1R109
1.2	J1R110
1.6	J1R111
1.0	J1R112
3.3	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	4.8
Censored		Lognormal mean	3.7
Detection limit or PQL		Std. devn.	10.8
Method detection limit		Median	1.4
TOTAL	12	Min.	0.4
		Max.	38.9

Lognormal distribution? r-squared is: 0.868
Normal distribution? r-squared is: 0.387
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 9.9

Nitrogen in Nitrate and Nitrite 95% UCL Calculation

DATA	ID
2.36	J1R102/ J1R114
3.92	J1R103
40.4	J1R104
1.44	J1R105
0.77	J1R106
3.00	J1R107
0.46	J1R108
0.71	J1R109
1.17	J1R110
1.58	J1R111
1.04	J1R112
3.29	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	5.01
Censored		Lognormal mean	3.79
Detection limit or PQL		Std. devn.	11.2
Method detection limit		Median	1.51
TOTAL	12	Min.	0.46
		Max.	40.4

Lognormal distribution? r-squared is: 0.846
Normal distribution? r-squared is: 0.384
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 10.3

Sulfate 95% UCL Calculation

DATA	ID
9.0	J1R102/ J1R114
9.6	J1R103
69.6	J1R104
7.6	J1R105
6.6	J1R106
7.2	J1R107
4.5	J1R108
7.1	J1R109
5.4	J1R110
7.8	J1R111
3.4	J1R112
4.7	J1R113

Number of samples		Uncensored values	
Uncensored	12	Mean	11.9
Censored		Lognormal mean	10.3
Detection limit or PQL		Std. devn.	18.3
Method detection limit		Median	7.15
TOTAL	12	Min.	3.40
		Max.	69.6

Lognormal distribution? r-squared is: 0.688
Normal distribution? r-squared is: 0.390
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 20.5

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 31 of 35

Duplicate Analysis - 100-D-50:1 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Uranium-233/234 (AEA)			Uranium-238 (AEA)			Aluminum			Arsenic		
			pCi/g	Q	MDA	pCi/g	Q	MDA	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
EXC-9	J1R0V0	8/30/12	12.2		0.159	0.442		0.034	0.733		0.069	0.597		0.029	0.733		0.069	0.610		0.187	0.610		0.187	6320	J	11.4	2.48		2.28
Duplicate of J1R0V0	J1R0V5	8/30/12	12.7		0.232	0.465		0.041	0.700		0.080	0.691		0.030	0.700		0.080	0.544		0.198	0.674		0.198	5990	J	13.3	2.21	B	2.65

Analysis:

TDL			0.5			0.1			0.2			1			1			1			1			5			10		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)		
	Both >5xTDL?		Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)					
	RPD		4.0%																					5.4%					
	Difference > 2 TDL?		Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			No - acceptable		

Duplicate Analysis - 100-D-50:1 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Barium			Beryllium			Calcium			Chromium			Cobalt			Copper			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	71.6		1.14	0.260	B	0.456	6940	J	228	9.51		0.456	7.58		4.56	12.9		2.28	23400		45.6	3.47		1.14	4620		171
Duplicate of J1R0V0	J1R0V5	8/30/12	66.1		1.33	0.241	B	0.531	6200	J	265	7.52		0.531	7.28		5.31	12.7		2.65	22200		53.1	3.25		1.33	4310		199

Analysis:

TDL			2			0.2			100			1			2			1			5			5			75		
Duplicate Analysis	Both > PQL?		Yes (continue)			No-Stop (acceptable)			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)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)		
	RPD		8.0%						11.3%			23.4%						1.6%			5.3%						6.9%		
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		

Duplicate Analysis - 100-D-50:1 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Manganese			Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrate as Nitrogen [a]		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	331		11.4	10.4		9.11	1060		911	590		4.56	291		114	64.4		5.70	41.1		22.8	1.0	B	0.9	2.0	J	0.2
Duplicate of J1R0V0	J1R0V5	8/30/12	312		13.3	8.81	B	10.6	993	B	1060	349		5.31	271		133	62.6		6.63	38.7		26.5	1.1	B	1.0	1.9	J	0.2

Analysis:

TDL			5			4			400			2			50			2.5			1			2			0.75		
Duplicate Analysis	Both > PQL?		Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)			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)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD		5.9%									*51.3%*			7.1%			2.8%			6.0%								
	Difference > 2 TDL?		Not applicable			No - acceptable			No - acceptable			Not applicable			Not applicable			Not applicable			Not applicable			No - acceptable			No - acceptable		

Duplicate Analysis - 100-D-50:1 Subsite Excavation

Sampling Area	Sample Number	Sample Date	Nitrogen in Nitrite and Nitrate			Orthophosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	1.68		0.09	2.8	JB	1.9	9.1		0.9
Duplicate of J1R0V0	J1R0V5	8/30/12	1.90		0.10	3.2	JB	2.0	9.4		1.0

Analysis:

TDL			0.75			5			5																				
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)																				
	Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)																				
	RPD																												
	Difference > 2 TDL?		No - acceptable			No - acceptable			No - acceptable																				

Acronyms and qualifiers are defined on sheet 3.

[a] **Nitrate has been converted to nitrogen as nitrate**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 32 of 35

Duplicate Analysis - 100-D-50:1 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Uranium-233/234 (AEA)			Uranium-238 (AEA)			Aluminum			Arsenic		
			pCi/g	Q	MDA	pCi/g	Q	MDA	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
SPA-7	J1R0W2	8/29/12	13.2		0.240	0.502		0.038	0.786		0.089	0.762		0.029	0.786		0.089	0.874		0.186	0.947		0.186	7740		10.8	2.91		2.17
Duplicate of J1R0W2	J1R0W8	8/29/12	12.6		0.226	0.509		0.041	0.739		0.097	0.728		0.028	0.739		0.097	0.590		0.215	0.478		0.215	7190		12.8	2.89		2.57

Analysis:

TDL		Potassium-40	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium-233/234 (AEA)	Uranium-238 (AEA)	Aluminum	Arsenic
		0.5	0.1	0.2	1	1	1	1	5	10
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)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	4.7%	1.4%						7.4%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-50:1 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-7	J1R0W2	8/29/12	73.9		1.08	0.291	B	0.433	2.58	B	4.33	0.162	B	0.433	8370		217	10.2		0.433	7.49		4.33	15.6		2.17	22300		43.3
Duplicate of J1R0W2	J1R0W8	8/29/12	79.1		1.28	0.272	B	0.513	2.51	B	5.13	0.171	B	0.513	8690		257	9.15		0.513	7.92		5.13	16.1		2.57	24100		51.3

Analysis:

TDL		Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
		2	0.2	2	0.2	100	1	2	1	5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)				Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	6.8%				3.8%	10.9%		3.2%	7.8%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Lead			Magnesium			Manganese			Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-7	J1R0W2	8/29/12	8.81		1.08	4710		162	326		10.8	11.1		8.67	1360		867	950		4.33	317		108	56.7		5.42	44.5		21.7
Duplicate of J1R0W2	J1R0W8	8/29/12	8.74		1.28	4520		193	341		12.8	9.78	B	10.3	1310		1030	958		5.13	308		128	63.6		6.42	47.5		25.7

Analysis:

TDL		Lead	Magnesium	Manganese	Nickel	Potassium	Silicon	Sodium	Vanadium	Zinc
		5	75	5	4	400	2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	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)	Yes (calc RPD)	Yes (calc RPD)
	RPD		4.1%	4.5%			0.8%	2.9%	11.5%	6.5%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite Staging Pile Area

Sampling Area	Sample Number	Sample Date	Chloride			Nitrate as Nitrogen [a]			Nitrogen in Nitrite and Nitrate			Orthophosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-7	J1R0W2	8/29/12	12.1		1.0	41.1	D	1.1	40.4	D	0.97	2.8	B	1.9	86.9		1.0
Duplicate of J1R0W2	J1R0W8	8/29/12	13.4		1.0	43.1	D	1.1	43.6	D	0.99	2.7	B	2.0	98.5		1.0

Analysis:

TDL		Chloride	Nitrate as Nitrogen	Nitrogen in Nitrite and Nitrate	Orthophosphate	Sulfate
		2	0.75	0.75	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	10.2%	4.8%	7.6%		12.5%
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable

Acronyms and qualifiers are defined on sheet 3.

[a] **Nitrate has been converted to nitrogen as nitrate**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-D Field Remediation
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations

Date 10/24/12
Job No. 14655

Calc. No. 0100D-CA-V0482
Checked N. K. Schiffern

Rev. No. 0
Date 10/24/12
Sheet No. 33 of 35

Duplicate Analysis - 100-D-50:1 Subsite North Overburden

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Uranium-233/234 (AEA)			Uranium-238 (AEA)			Aluminum			Arsenic		
			pCi/g	Q	MDA	pCi/g	Q	MDA	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
N-OB-10	J1R0X8	8/30/12	11.3		0.302	0.517		0.045	0.761		0.124	0.611		0.032	0.761		0.124	0.585		0.204	0.612		0.204	7810		4.56	2.49		0.911
Duplicate of J1R0X8	J1R101	8/30/12	12.5		0.180	0.440		0.045	0.692		0.106	0.663		0.031	0.692		0.106	0.498		0.201	0.394		0.201	7630		4.47	2.62		0.894

Analysis:

TDL		0.5	0.1	0.2	1	1	1	1	5	10
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)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	10.1%							2.3%	
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-50:1 Subsite North Overburden

Sampling Area	Sample Number	Sample Date	Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
			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
N-OB-10	J1R0X8	8/30/12	68.9		0.456	0.285		0.182	1.47	B	1.82	0.110	B	0.182	7700		91.1	9.78		0.182	7.33		1.82	15.3		0.911	25400		18.2
Duplicate of J1R0X8	J1R101	8/30/12	67.3		0.447	0.280		0.179	2.53		1.79	0.098	B	0.179	7700		89.4	8.70		0.179	7.90		1.79	15.2		0.894	25800		17.9

Analysis:

TDL		2	0.2	2	0.2	100	1	2	1	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	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)
	RPD	2.3%				0.0%	11.7%		0.7%	1.6%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite North Overburden

Sampling Area	Sample Number	Sample Date	Lead			Magnesium			Manganese			Molybdenum			Nickel			Potassium			Silicon			Sodium			Vanadium		
			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
N-OB-10	J1R0X8	8/30/12	3.52		0.456	4880		68.3	358		4.56	0.368	B	1.82	9.37		3.64	1320		364	705		1.82	335		45.6	76.1		2.28
Duplicate of J1R0X8	J1R101	8/30/12	3.48		0.447	5160		67.1	363		4.47	0.367	B	1.79	10.8		3.58	1320		358	746		1.79	299		44.7	75.7		2.24

Analysis:

TDL		5	75	5	2	4	400	2	50	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		5.6%	1.4%				5.7%	11.4%	0.5%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite North Overburden

Sampling Area	Sample Number	Sample Date	Zinc			Nitrate as nitrogen [a]			Nitrogen in Nitrite and Nitrate			Orthophosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
N-OB-10	J1R0X8	8/30/12	46.3		9.11	1.6		0.2	1.83		0.10	2.3	B	1.9	3.9	B	1.0
Duplicate of J1R0X8	J1R101	8/30/12	48.0		8.94	1.6		0.2	1.80		0.09	2.8	B	1.9	5.7		0.9

Analysis:

TDL		1	0.75	0.75	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	3.6%				
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Acronyms and qualifiers are defined on sheet 3.

[a] Nitrate has been converted to nitrogen as nitrate

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 34 of 35

Duplicate Analysis - 100-D-50:1 Subsite South Overburden

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Uranium-233/234 (AEA)			Aluminum			Arsenic			Barium		
			pCi/g	Q	MDA	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
S-OB-1	J1R102	8/30/12	11.1		0.171	0.410		0.039	0.608		0.067	0.594		0.027	0.608		0.067	0.316		0.202	8490		4.75	3.04		0.950	66.5		0.475
Duplicate of J1R102	J1R114	8/30/12	13.5		0.350	0.465		0.062	0.682		0.108	0.876		0.042	0.682		0.108	0.502		0.384	7880		4.74	3.02		0.949	65.0		0.474

Analysis:

TDL		0.5	0.1	0.2	1	1	1	5	10	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?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	19.5%						7.5%		2.3%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite South Overburden

Sampling Area	Sample Number	Sample Date	Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron			Lead		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
S-OB-1	J1R102	8/30/12	0.316		0.190	2.66		1.90	0.109	B	0.190	9470		95.0	9.29		0.190	7.42		1.90	15.9		0.950	25300		19.0	4.15		0.475
Duplicate of J1R102	J1R114	8/30/12	0.312		0.190	1.34	B	1.90	0.108	B	0.190	8940		94.9	9.59		0.190	7.95		1.90	15.8		0.949	24200		19.0	4.73		0.474

Analysis:

TDL		0.2	2	0.2	100	1	2	1	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	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)
	RPD				5.8%	3.2%		0.6%	4.4%	
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-50:1 Subsite South Overburden

Sampling Area	Sample Number	Sample Date	Magnesium			Manganese			Molybdenum			Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
S-OB-1	J1R102	8/30/12	5540		71.2	373		4.75	0.432	B	1.90	11.7		3.80	1360		380	629		1.90	391		47.5	67.1		2.37	49.2		9.50
Duplicate of J1R102	J1R114	8/30/12	5180		71.2	347		4.74	0.368	B	1.90	10.8		3.80	1310		380	747		1.90	336		47.4	69.4		2.37	49.1		9.49

Analysis:

TDL		75	5	2	4	400	2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	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)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD	6.7%	7.2%				17.2%	15.1%	3.4%	0.2%
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite South Overburden

Sampling Area	Sample Number	Sample Date	Chloride			Nitrate as Nitrogen [a]			Nitrogen in Nitrite and Nitrate			Orthophosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
S-OB-1	J1R102	8/30/12	1.7	B	1.0	2.4		0.2	2.68		0.10	1.9	B	1.9	10.1		1.0
Duplicate of J1R102	J1R114	8/30/12	2.3	B	0.9	2.1		0.2	2.03		0.09	3.4	B	1.8	7.8		0.9

Analysis:

TDL		2	0.75	0.75	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	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

Acronyms and qualifiers are defined on sheet 3.

[a] **Nitrate has been converted to nitrogen as nitrate**

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/24/12 **Calc. No.** 0100D-CA-V0482 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/24/12
Subject 100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 35 of 35

Duplicate Analysis - 100-D-50:1 Subsite Test Pit 3 Pipe Sediment

Sampling Area	Sample Number	Sample Date	Cesium-137			Europium-152			Gross alpha			Gross beta			Nickel-63			Thorium-228			Uranium-233/234			Uranium-238			Aluminum		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	1.92		0.079	0.526		0.17	10.9		3.7	15.5		5.8	6.36		3.3	0.248		0.12	0.242		0.17	0.264		0.17	6370		13.8
Duplicate of J10VF2	J10VF3	12/27/05	1.86		0.074	0.607		0.15	5.70		3.4	16.5		5.9	5.01		3.3	0.316		0.078	0.498		0.19	0.448		0.19	7050		15.1

Analysis:

TDL			0.05	0.1	10	15	30	1	1	1	5
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)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		3.2%	14.3%							10.1%
	Difference > 2 TDL?		Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite Test Pit 3 Pipe Sediment

Sampling Area	Sample Number	Sample Date	Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	5.6	C	2.6	102		0.15	0.27		0.08	5.9		2.0	1.2		0.53	7660	C	8.9	97.5		1.2	8.5		0.90	57.3	C	0.90
Duplicate of J10VF2	J10VF3	12/27/05	7.0	C	2.8	116		0.16	0.25		0.08	6.7		2.2	1.4		0.58	14100	C	9.8	103		1.3	8.1		0.99	52.3	C	0.99

Analysis:

TDL			10	2	0.2	2	0.2	100	1	2	1
Duplicate Analysis	Both > PQL?		Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?		No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD			12.8%			15.4%	59.2%	5.5%		9.1%
	Difference > 2 TDL?		No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite Test Pit 3 Pipe Sediment

Sampling Area	Sample Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Nickel			Potassium			Silicon			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	29000		24.1	50.3		2.3	5270		10.1	441	C	0.15	3.1		0.06	22.5		0.98	1320		41.6	518		6.2	349	C	1.3
Duplicate of J10VF2	J10VF3	12/27/05	24000		26.5	57.6		2.6	5360		11.1	450	C	0.16	2.5		0.02	20.8		1.1	1470		45.7	603		6.8	425	C	1.4

Analysis:

TDL			5	5	75	5	0.2	4	400	2	50
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)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD		18.9%	13.5%	1.7%	2.0%	21.4%	7.9%		15.2%	19.6%
	Difference > 2 TDL?		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 100-D-50:1 Subsite Test Pit 3 Pipe Sediment

Sampling Area	Sample Number	Sample Date	Vanadium			Zinc			Aroclor-1260			4,4'-DDT			Endrin aldehyde			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene		
			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	ug/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	37.6		0.68	249		0.38	51	J	53	16	JD	27	10	JD	27	2700	JD	4400	3000	JD	4400	2800	JD	4400	1800	JD	4400
Duplicate of J10VF2	J10VF3	12/27/05	36.1		0.74	270		0.41	73		59	22	JD	30	17	JD	30	1700	JD	20000	1700	JD	20000	2000	JD	20000	1100	JD	20000

Analysis:

TDL			2.5	1	20	5	5	660	660	660	660
Duplicate Analysis	Both > PQL?		Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?		Yes (calc RPD)	Yes (calc RPD)							
	RPD		4.1%	8.1%							
	Difference > 2 TDL?		Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-50:1 Subsite Test Pit 3 Pipe Sediment

Sampling Area	Sample Number	Sample Date	Benzo(k)fluoranthene			Bis(2-Ethylhexyl) phthalate			Chrysene			Fluoranthene			Pyrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	2500	JD	4400	880	JBD	4400	3200	JD	4400	4400	D	4400	3300	JD	4400
Duplicate of J10VF2	J10VF3	12/27/05	1800	JD	20000	1500	JB	20000	2300	JD	20000	3600	JD	20000	2300	JD	20000

Analysis:

TDL			660	660	660	660	660
Duplicate Analysis	Both > PQL?		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?					Yes (calc RPD)	
	RPD						
	Difference > 2 TDL?		No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable

Acronyms and qualifiers are defined on sheet 3.

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Radionuclides).

Location	HEIS Number	Sample Date	Americium-241			Carbon-14			Cesium-137			Cobalt-60		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
EXC-9	J1R0V0	8/30/12	0.089	U	0.089	0.510	UJ	0.903	0.018	U	0.018	0.018	U	0.018
Duplicate of J1R0V0	J1R0V5	8/30/12	0.135	U	0.135	0.788	UJ	0.863	0.019	U	0.019	0.022	U	0.022
EXC-1	J1R0T2	8/30/12	0.164	U	0.164	0.819	UJ	0.829	0.024	U	0.024	0.027	U	0.027
EXC-2	J1R0T3	8/30/12	0.090	U	0.090	1.05	J	0.803	0.026	U	0.026	0.026	U	0.026
EXC-3	J1R0T4	8/30/12	0.097	U	0.097	0.682	UJ	0.823	0.019	U	0.019	0.021	U	0.021
EXC-4	J1R0T5	8/30/12	0.044	U	0.044	0.899	J	0.886	0.033	U	0.033	0.037	U	0.037
EXC-5	J1R0T6	8/30/12	0.437	U	0.437	1.12	J	0.795	0.049	U	0.049	0.054	U	0.054
EXC-6	J1R0T7	8/30/12	0.053	U	0.053	0.734	UJ	0.862	0.025	U	0.025	0.027	U	0.027
EXC-7	J1R0T8	8/30/12	0.169	U	0.169	0.429	UJ	0.857	0.025	U	0.025	0.028	U	0.028
EXC-8	J1R0T9	8/30/12	0.091	U	0.091	1.64	J	0.852	0.032	U	0.032	0.031	U	0.031
EXC-10	J1R0V1	8/30/12	0.048	U	0.048	0.481	UJ	0.890	0.036	U	0.036	0.037	U	0.037
EXC-11	J1R0V2	8/30/12	0.368	U	0.368	0.726	UJ	0.864	0.044	U	0.044	0.051	U	0.051
EXC-12	J1R0V3	8/30/12	0.055	U	0.055	0.106	UJ	0.880	0.029	U	0.029	0.026	U	0.026
SPA-7	J1R0W2	8/29/12	0.138	U	0.138	0.428	U	0.878	0.019	U	0.022	0.021	U	0.021
Duplicate of J1R0W2	J1R0W8	8/29/12	0.043	U	0.043	1.16		0.889	0.022		0.018	0.021	U	0.021
SPA-1	J1R0V6	8/29/12	0.029	U	0.029	0.938		0.829	0.037		0.005	0.006	U	0.006
SPA-2	J1R0V7	8/29/12	0.113	U	0.113	0.690	U	0.807	0.013	U	0.013	0.014	U	0.014
SPA-3	J1R0V8	8/29/12	0.015	U	0.015	0.426	U	0.857	0.013		0.007	0.007	U	0.007
SPA-4	J1R0V9	8/29/12	0.045	U	0.045	0.935		0.836	0.014		0.007	0.007	U	0.007
SPA-5	J1R0W0	8/29/12	0.313	U	0.313	0.823	U	0.860	0.039	U	0.039	0.040	U	0.040
SPA-6	J1R0W1	8/29/12	0.048	U	0.048	0.621	U	0.849	0.023	U	0.023	0.025	U	0.025
SPA-8	J1R0W3	8/29/12	0.037	U	0.037	1.09		0.885	0.025	U	0.025	0.027	U	0.027
SPA-9	J1R0W4	8/29/12	0.070	U	0.070	0.986		0.864	0.020	U	0.020	0.023	U	0.023
SPA-10	J1R0W5	8/29/12	0.108	U	0.108	0.790	U	0.876	0.020	U	0.020	0.020	U	0.020
SPA-11	J1R0W6	8/29/12	0.034	U	0.034	0.775	U	0.859	0.026	U	0.026	0.027	U	0.027
SPA-12	J1R0W7	8/29/12	0.334	U	0.334	0.955		0.890	0.039	U	0.039	0.040	U	0.040
N-OB-10	J1R0X8	8/30/12	0.081	U	0.081	1.19		0.842	0.024	U	0.024	0.029	U	0.029
Duplicate of J1R0X8	J1R101	8/30/12	0.043	U	0.043	0.726	U	0.875	0.021	U	0.021	0.023	U	0.023
N-OB-1	J1R0W9	8/30/12	0.048	U	0.048	0.160	U	0.824	0.023		0.008	0.008	U	0.008
N-OB-2	J1R0X0	8/30/12	0.015	U	0.015	0.591	U	0.807	0.007	U	0.007	0.008	U	0.008
N-OB-3	J1R0X1	8/30/12	0.014	U	0.014	0.862		0.760	0.021		0.013	0.011	U	0.011
N-OB-4	J1R0X2	8/30/12	0.091	U	0.091	0.865		0.794	0.019	U	0.019	0.019	U	0.019
N-OB-5	J1R0X3	8/30/12	0.359	U	0.359	1.11		0.799	0.042	U	0.042	0.042	U	0.042
N-OB-6	J1R1P5	9/4/12	0.033	U	0.033	1.80		1.33	0.016	U	0.016	0.015	U	0.015
N-OB-7	J1R0X5	8/30/12	0.040	U	0.040	0.880		0.782	0.022	U	0.022	0.023	U	0.023
N-OB-8	J1R0X6	8/30/12	0.122	U	0.122	0.221	U	0.788	0.019	U	0.019	0.020	U	0.020
N-OB-9	J1R0X7	8/30/12	0.033	U	0.033	0.533	U	0.781	0.024	U	0.024	0.023	U	0.023
N-OB-11	J1R0X9	8/30/12	0.105	U	0.105	0.761	U	0.837	0.032	U	0.032	0.022	U	0.022
N-OB-12	J1R100	8/30/12	0.399	U	0.399	0.696	U	0.839	0.053	U	0.053	0.051	U	0.051
S-OB-1	J1R102	8/30/12	0.088	U	0.088	1.72		0.912	0.018	U	0.018	0.018	U	0.018
Duplicate of J1R102	J1R114	8/30/12	0.036	U	0.036	-1.13	U	0.924	0.026	U	0.026	0.029	U	0.029
S-OB-2	J1R103	8/30/12	0.366	U	0.366	2.00		1.14	0.123		0.045	0.045	U	0.045
S-OB-3	J1R104	8/30/12	0.042	U	0.042	1.94		0.958	0.023	U	0.023	0.021	U	0.021
S-OB-4	J1R105	8/30/12	0.140	U	0.140	2.11		0.978	0.022	U	0.022	0.025	U	0.025
S-OB-5	J1R106	8/30/12	0.087	U	0.087	1.99		1.47	0.018	U	0.018	0.016	U	0.016
S-OB-6	J1R107	8/30/12	0.153	U	0.153	1.39		0.846	0.026	U	0.026	0.026	U	0.026
S-OB-7	J1R108	8/30/12	0.040	U	0.040	1.10		0.954	0.026	U	0.026	0.031	U	0.031
S-OB-8	J1R109	8/30/12	0.372	U	0.372	-0.045	U	0.943	0.038	U	0.038	0.052	U	0.052
S-OB-9	J1R110	8/30/12	0.037	U	0.037	-0.542	U	0.896	0.019	U	0.019	0.022	U	0.022
S-OB-10	J1R111	8/30/12	0.086	U	0.086	-0.233	U	0.887	0.021	U	0.021	0.025	U	0.025
S-OB-11	J1R112	8/30/12	0.091	U	0.091	-0.671	U	0.900	0.027		0.018	0.018	U	0.018
S-OB-12	J1R113	8/30/12	0.147	U	0.147	-0.480	U	0.898	0.044		0.029	0.023	U	0.023
FS-1	J1R0V4	9/4/12	0.142	U	0.142	0.815	UJ	0.933	0.024	U	0.024	0.024	U	0.024

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

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

Note: Data qualified with B, D, and/or J.

AEA = alpha energy analysis

B = blank contamination (inorganic constituents)

D = identifies all compounds identified in an analysis at a secondary dilution factor

EXC = excavation

FS = focused sample

GEA = gamma energy analysis

HEIS = Hanford Environmental Information System

J = estimate

MDA = minimum detectable activity

N-OB = north overburden

PCB = polychlorinated biphenyls

PEST = pesticides

PQL = practical quantitative limit

Q = qualifier

R = rejected

S-OB = south overburden

U = undetected

SPA = staging pile area

SVOA = semivolatile organic analysis

Attachment	1	Sheet No.	1 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Radionuclides).

Location	HEIS Number	Sample Date	Europium-152			Europium-154			Europium-155			Nickel-63		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
EXC-9	J1R0V0	8/30/12	0.048	U	0.048	0.062	U	0.062	0.070	U	0.070	0.966	U	5.16
Duplicate of J1R0V0	J1R0V5	8/30/12	0.054	U	0.054	0.079	U	0.079	0.071	U	0.071	2.59	U	4.98
EXC-1	J1R0T2	8/30/12	0.067	U	0.067	0.095	U	0.095	0.082	U	0.082	0.804	U	5.52
EXC-2	J1R0T3	8/30/12	0.061	U	0.061	0.096	U	0.096	0.095	U	0.095	1.85	U	5.24
EXC-3	J1R0T4	8/30/12	0.057	U	0.057	0.072	U	0.072	0.079	U	0.079	0.416	U	5.00
EXC-4	J1R0T5	8/30/12	0.105	U	0.105	0.117	U	0.117	0.089	U	0.089	1.28	U	5.12
EXC-5	J1R0T6	8/30/12	0.135	U	0.135	0.182	U	0.182	0.158	U	0.158	1.99	U	5.32
EXC-6	J1R0T7	8/30/12	0.077	U	0.077	0.079	U	0.079	0.081	U	0.081	-0.105	U	5.04
EXC-7	J1R0T8	8/30/12	0.066	U	0.066	0.094	U	0.094	0.085	U	0.085	1.65	U	4.97
EXC-8	J1R0T9	8/30/12	0.064	U	0.064	0.112	U	0.112	0.076	U	0.076	0.515	U	4.95
EXC-10	J1R0V1	8/30/12	0.100	U	0.100	0.122	U	0.122	0.160	U	0.160	1.49	U	5.12
EXC-11	J1R0V2	8/30/12	0.121	U	0.121	0.153	U	0.153	0.144	U	0.144	0.420	U	5.05
EXC-12	J1R0V3	8/30/12	0.079	U	0.079	0.089	U	0.089	0.085	U	0.085	0.102	U	4.93
SPA-7	J1R0W2	8/29/12	0.054	U	0.054	0.073	U	0.073	0.070	U	0.070	0.208	U	3.25
Duplicate of J1R0W2	J1R0W8	8/29/12	0.061	U	0.061	0.065	U	0.065	0.068	U	0.068	-0.082	U	3.19
SPA-1	J1R0V6	8/29/12	0.017	U	0.017	0.019	U	0.019	0.030	U	0.030	0.623	U	3.24
SPA-2	J1R0V7	8/29/12	0.035	U	0.035	0.045	U	0.045	0.043	U	0.043	-0.574	U	3.20
SPA-3	J1R0V8	8/29/12	0.021	U	0.021	0.023	U	0.023	0.040	U	0.040	0.282	U	3.15
SPA-4	J1R0V9	8/29/12	0.017	U	0.017	0.025	U	0.025	0.040	U	0.040	-0.693	U	3.18
SPA-5	J1R0W0	8/29/12	0.100	U	0.100	0.122	U	0.122	0.121	U	0.121	-0.119	U	3.11
SPA-6	J1R0W1	8/29/12	0.067	U	0.067	0.080	U	0.080	0.071	U	0.071	-0.548	U	3.06
SPA-8	J1R0W3	8/29/12	0.077	U	0.077	0.089	U	0.089	0.079	U	0.079	0.270	U	3.02
SPA-9	J1R0W4	8/29/12	0.047	U	0.047	0.077	U	0.077	0.057	U	0.057	-0.120	U	3.12
SPA-10	J1R0W5	8/29/12	0.060	U	0.060	0.073	U	0.073	0.083	U	0.083	0.120	U	3.12
SPA-11	J1R0W6	8/29/12	0.075	U	0.075	0.101	U	0.101	0.072	U	0.072	0.272	U	3.04
SPA-12	J1R0W7	8/29/12	0.106	U	0.106	0.148	U	0.148	0.126	U	0.126	-0.157	U	3.06
N-OB-10	J1R0X8	8/30/12	0.056	U	0.056	0.085	U	0.085	0.068	U	0.068	1.48	U	3.02
Duplicate of J1R0X8	J1R101	8/30/12	0.060	U	0.060	0.071	U	0.071	0.069	U	0.069	0.999	U	2.94
N-OB-1	J1R0W9	8/30/12	0.018	U	0.018	0.027	U	0.027	0.055	U	0.055	1.06	U	3.01
N-OB-2	J1R0X0	8/30/12	0.020	U	0.020	0.023	U	0.023	0.031	U	0.031	1.82	U	2.97
N-OB-3	J1R0X1	8/30/12	0.030	U	0.030	0.039	U	0.039	0.046	U	0.046	0.944	U	3.02
N-OB-4	J1R0X2	8/30/12	0.055	U	0.055	0.063	U	0.063	0.073	U	0.073	1.46	U	3.16
N-OB-5	J1R0X3	8/30/12	0.112	U	0.112	0.148	U	0.148	0.132	U	0.132	2.45	U	3.06
N-OB-6	J1R1P5	9/4/12	0.048	U	0.048	0.052	U	0.052	0.067	U	0.067	-1.72	U	3.26
N-OB-7	J1R0X5	8/30/12	0.061	U	0.061	0.068	U	0.068	0.064	U	0.064	0.836	U	3.42
N-OB-8	J1R0X6	8/30/12	0.046	U	0.046	0.073	U	0.073	0.064	U	0.064	0.504	U	3.09
N-OB-9	J1R0X7	8/30/12	0.065	U	0.065	0.086	U	0.086	0.078	U	0.078	1.93	U	3.03
N-OB-11	J1R0X9	8/30/12	0.061	U	0.061	0.075	U	0.075	0.083	U	0.083	1.21	U	2.88
N-OB-12	J1R100	8/30/12	0.126	U	0.126	0.172	U	0.172	0.149	U	0.149	1.37	U	2.97
S-OB-1	J1R102	8/30/12	0.056	U	0.056	0.061	U	0.061	0.071	U	0.071	0	U	3.29
Duplicate of J1R102	J1R114	8/30/12	0.077	U	0.077	0.095	U	0.095	0.071	U	0.071	0.124	U	3.09
S-OB-2	J1R103	8/30/12	0.122	U	0.122	0.173	U	0.173	0.141	U	0.141	-1.24	U	3.17
S-OB-3	J1R104	8/30/12	0.064	U	0.064	0.070	U	0.070	0.072	U	0.072	0.437	U	3.26
S-OB-4	J1R105	8/30/12	0.061	U	0.061	0.072	U	0.072	0.081	U	0.081	1.92	U	3.49
S-OB-5	J1R106	8/30/12	0.055	U	0.055	0.057	U	0.057	0.069	U	0.069	-0.458	U	3.41
S-OB-6	J1R107	8/30/12	0.066	U	0.066	0.084	U	0.084	0.087	U	0.087	0.215	U	3.20
S-OB-7	J1R108	8/30/12	0.085	U	0.085	0.102	U	0.102	0.081	U	0.081	-1.70	U	3.32
S-OB-8	J1R109	8/30/12	0.122	U	0.122	0.172	U	0.172	0.142	U	0.142	2.79	U	3.40
S-OB-9	J1R110	8/30/12	0.058	U	0.058	0.066	U	0.066	0.063	U	0.063	1.40	U	3.05
S-OB-10	J1R111	8/30/12	0.056	U	0.056	0.085	U	0.085	0.063	U	0.063	0.519	U	3.22
S-OB-11	J1R112	8/30/12	0.057	U	0.057	0.064	U	0.064	0.073	U	0.073	1.52	U	3.23
S-OB-12	J1R113	8/30/12	0.065	U	0.065	0.076	U	0.076	0.084	U	0.084	0.259	U	3.21
FS-1	J1R0V4	9/4/12	0.062	U	0.062	0.080	U	0.080	0.083	U	0.083	-1.69	U	3.62

Attachment	1	Sheet No.	2 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Radionuclides).

Location	HEIS Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
EXC-9	J1R0V0	8/30/12	12.2		0.159	0.442		0.034	0.733		0.069	0.597		0.029
Duplicate of J1R0V0	J1R0V5	8/30/12	12.7		0.232	0.465		0.041	0.700		0.080	0.691		0.030
EXC-1	J1R0T2	8/30/12	12.9		0.249	0.485		0.045	0.828		0.114	0.802		0.039
EXC-2	J1R0T3	8/30/12	11.3		0.299	0.453		0.053	0.716		0.130	0.648		0.032
EXC-3	J1R0T4	8/30/12	12.0		0.199	0.417		0.040	0.705		0.088	0.636		0.030
EXC-4	J1R0T5	8/30/12	13.6		0.386	0.616		0.070	0.893		0.140	0.998		0.050
EXC-5	J1R0T6	8/30/12	10.5		0.468	0.509		0.102	0.566		0.214	0.973		0.093
EXC-6	J1R0T7	8/30/12	13.8		0.262	0.581		0.059	0.832		0.118	0.882		0.034
EXC-7	J1R0T8	8/30/12	13.0		0.330	0.569		0.056	0.940		0.129	0.892		0.037
EXC-8	J1R0T9	8/30/12	11.9		0.229	0.467		0.054	0.769		0.126	0.724		0.034
EXC-10	J1R0V1	8/30/12	16.9		0.458	0.662		0.066	1.03		0.142	1.30		0.053
EXC-11	J1R0V2	8/30/12	10.2		0.362	0.536		0.096	0.743		0.167	0.921		0.087
EXC-12	J1R0V3	8/30/12	15.1		0.236	0.513		0.050	0.840		0.119	0.809		0.039
SPA-7	J1R0W2	8/29/12	13.2		0.240	0.502		0.038	0.786		0.089	0.762		0.029
Duplicate of J1R0W2	J1R0W8	8/29/12	12.6		0.226	0.509		0.041	0.739		0.097	0.728		0.028
SPA-1	J1R0V6	8/29/12	11.1		0.052	0.375		0.012	0.630		0.026	0.566		0.009
SPA-2	J1R0V7	8/29/12	10.9		0.138	0.418		0.024	0.646		0.063	0.790		0.025
SPA-3	J1R0V8	8/29/12	13.0		0.069	0.467		0.015	0.716		0.033	0.707		0.009
SPA-4	J1R0V9	8/29/12	11.5		0.072	0.405		0.014	0.603		0.032	0.610		0.010
SPA-5	J1R0W0	8/29/12	11.6		0.381	0.485		0.065	0.684		0.158	0.816		0.074
SPA-6	J1R0W1	8/29/12	15.1		0.202	0.483		0.050	0.766		0.110	0.816		0.030
SPA-8	J1R0W3	8/29/12	15.1		0.270	0.525		0.050	0.889		0.120	1.02		0.040
SPA-9	J1R0W4	8/29/12	10.9		0.198	0.393		0.039	0.674		0.101	0.578		0.026
SPA-10	J1R0W5	8/29/12	14.3		0.205	0.571		0.046	0.856		0.106	0.913		0.030
SPA-11	J1R0W6	8/29/12	14.8		0.282	0.523		0.053	0.722		0.105	0.958		0.039
SPA-12	J1R0W7	8/29/12	10.0		0.370	0.429		0.083	0.695		0.162	0.733		0.078
N-OB-10	J1R0X8	8/30/12	11.3		0.302	0.517		0.045	0.761		0.124	0.611		0.032
Duplicate of J1R0X8	J1R101	8/30/12	12.5		0.180	0.440		0.045	0.692		0.106	0.663		0.031
N-OB-1	J1R0W9	8/30/12	12.4		0.087	0.424		0.015	0.700		0.037	0.637		0.012
N-OB-2	J1R0X0	8/30/12	11.5		0.069	0.397		0.015	0.631		0.032	0.612		0.011
N-OB-3	J1R0X1	8/30/12	15.3		0.129	0.547		0.021	0.770		0.047	0.975		0.015
N-OB-4	J1R0X2	8/30/12	12.3		0.184	0.404		0.046	0.648		0.070	0.616		0.030
N-OB-5	J1R0X3	8/30/12	12.0		0.346	0.490		0.089	0.773		0.161	0.956		0.090
N-OB-6	J1R1P5	9/4/12	10.5		0.179	0.367		0.032	0.577		0.070	0.576		0.024
N-OB-7	J1R0X5	8/30/12	11.1		0.226	0.408		0.039	0.572		0.110	0.604		0.029
N-OB-8	J1R0X6	8/30/12	10.6		0.165	0.356		0.041	0.639		0.088	0.557		0.027
N-OB-9	J1R0X7	8/30/12	12.3		0.288	0.447		0.046	0.838		0.107	0.709		0.036
N-OB-11	J1R0X9	8/30/12	14.4		0.216	0.490		0.049	0.883		0.100	0.776		0.035
N-OB-12	J1R100	8/30/12	12.0		0.303	0.508		0.084	0.804		0.203	0.806		0.091
S-OB-1	J1R102	8/30/12	11.1		0.171	0.410		0.039	0.608		0.067	0.594		0.027
Duplicate of J1R102	J1R114	8/30/12	13.5		0.350	0.465		0.062	0.682		0.108	0.876		0.042
S-OB-2	J1R103	8/30/12	10.8		0.437	0.381		0.078	0.916		0.181	0.869		0.084
S-OB-3	J1R104	8/30/12	12.9		0.192	0.490		0.043	0.750		0.107	0.688		0.030
S-OB-4	J1R105	8/30/12	12.6		0.218	0.488		0.047	0.710		0.093	0.705		0.030
S-OB-5	J1R106	8/30/12	10.7		0.188	0.346		0.036	0.591		0.067	0.565		0.026
S-OB-6	J1R107	8/30/12	12.7		0.286	0.553		0.052	0.750		0.112	0.711		0.035
S-OB-7	J1R108	8/30/12	13.0		0.432	0.519		0.062	0.916		0.136	0.931		0.044
S-OB-8	J1R109	8/30/12	8.58		0.488	0.487		0.072	0.782		0.167	0.708		0.079
S-OB-9	J1R110	8/30/12	12.1		0.175	0.487		0.042	0.690		0.085	0.678		0.026
S-OB-10	J1R111	8/30/12	10.8		0.223	0.431		0.041	0.605		0.110	0.544		0.032
S-OB-11	J1R112	8/30/12	12.5		0.180	0.446		0.039	0.718		0.080	0.649		0.028
S-OB-12	J1R113	8/30/12	13.0		0.204	0.453		0.048	0.766		0.108	0.703		0.032
FS-1	J1R0V4	9/4/12	12.2		0.305	0.462		0.044	0.731		0.090	0.688		0.035

Attachment	1	Sheet No.	3 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Radionuclides).

Location	HEIS Number	Sample Date	Thorium-232			Total beta radiostrontium			Tritium			Uranium-233/234 (AEA)		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
EXC-9	J1R0V0	8/30/12	0.733		0.069	-0.060	U	0.343	2.42	UJ	3.27	0.610		0.187
Duplicate of J1R0V0	J1R0V5	8/30/12	0.700		0.080	0.020	U	0.302	2.60	UJ	3.11	0.544		0.198
EXC-1	J1R0T2	8/30/12	0.828		0.114	-0.019	U	0.282	1.21	UJ	2.96	0.725		0.198
EXC-2	J1R0T3	8/30/12	0.716		0.130	0.098	U	0.279	1.84	UJ	3.20	0.476		0.165
EXC-3	J1R0T4	8/30/12	0.705		0.088	-0.099	U	0.313	2.26	UJ	3.21	0.455		0.158
EXC-4	J1R0T5	8/30/12	0.893		0.140	-0.067	U	0.296	1.18	UJ	3.34	0.574		0.163
EXC-5	J1R0T6	8/30/12	0.566		0.214	0.102	U	0.313	2.62	UJ	3.22	0.510		0.170
EXC-6	J1R0T7	8/30/12	0.832		0.118	-0.069	U	0.296	0	UJ	3.15	0.596		0.182
EXC-7	J1R0T8	8/30/12	0.940		0.129	-0.040	U	0.279	3.08	UJ	3.20	0.635		0.174
EXC-8	J1R0T9	8/30/12	0.769		0.126	0.072	U	0.274	2.92	UJ	3.14	0.669		0.190
EXC-10	J1R0V1	8/30/12	1.03		0.142	-0.079	U	0.301	2.54	UJ	3.19	0.524		0.200
EXC-11	J1R0V2	8/30/12	0.743		0.167	-0.024	U	0.302	1.57	UJ	3.13	0.702		0.192
EXC-12	J1R0V3	8/30/12	0.840		0.119	-0.062	U	0.298	2.27	UJ	3.14	0.546		0.174
SPA-7	J1R0W2	8/29/12	0.786		0.089	-0.039	U	0.271	-0.849	U	3.58	0.874		0.186
Duplicate of J1R0W2	J1R0W8	8/29/12	0.739		0.097	-0.077	U	0.236	-1.64	U	3.70	0.590		0.215
SPA-1	J1R0V6	8/29/12	0.630		0.026	0.102	U	0.291	-0.742	U	3.61	0.556		0.185
SPA-2	J1R0V7	8/29/12	0.646		0.063	-0.089	U	0.277	-1.53	U	3.88	1.07		0.200
SPA-3	J1R0V8	8/29/12	0.716		0.033	0.076	U	0.287	-2.78	U	3.91	0.556		0.185
SPA-4	J1R0V9	8/29/12	0.603		0.032	0.139	U	0.284	-0.239	U	3.78	0.437		0.209
SPA-5	J1R0W0	8/29/12	0.684		0.158	0.070	U	0.277	-2.61	U	3.67	0.353		0.193
SPA-6	J1R0W1	8/29/12	0.766		0.110	0.087	U	0.266	-1.90	U	3.64	0.473		0.190
SPA-8	J1R0W3	8/29/12	0.889		0.120	-0.020	U	0.238	-1.49	U	3.77	0.398		0.169
SPA-9	J1R0W4	8/29/12	0.674		0.101	-0.099	U	0.304	-2.08	U	3.56	0.427		0.218
SPA-10	J1R0W5	8/29/12	0.856		0.106	-0.067	U	0.271	-0.853	U	3.60	0.660		0.144
SPA-11	J1R0W6	8/29/12	0.722		0.105	-0.007	U	0.285	-0.167	U	3.51	0.768		0.218
SPA-12	J1R0W7	8/29/12	0.695		0.162	0.067	U	0.229	0.059	U	3.76	0.618		0.215
N-OB-10	J1R0X8	8/30/12	0.761		0.124	0.102	U	0.283	1.56	U	3.26	0.585		0.204
Duplicate of J1R0X8	J1R101	8/30/12	0.692		0.106	0.148	U	0.303	-0.336	U	3.40	0.498		0.201
N-OB-1	J1R0W9	8/30/12	0.700		0.037	-0.006	U	0.279	0.884	U	3.35	0.482		0.184
N-OB-2	J1R0X0	8/30/12	0.631		0.032	-0.015	U	0.274	0.054	U	3.26	0.346		0.165
N-OB-3	J1R0X1	8/30/12	0.770		0.047	-0.040	U	0.275	0.421	U	3.20	0.370		0.177
N-OB-4	J1R0X2	8/30/12	0.648		0.070	-0.021	U	0.338	0.104	U	3.15	0.346		0.221
N-OB-5	J1R0X3	8/30/12	0.773		0.161	0.123	U	0.290	-0.372	U	3.22	0.542		0.188
N-OB-6	J1R1P5	9/4/12	0.577		0.070	0.025	U	0.235	2.30	U	3.12	0.484		0.047
N-OB-7	J1R0X5	8/30/12	0.572		0.110	0.008	U	0.299	-0.726	U	3.15	0.313		0.171
N-OB-8	J1R0X6	8/30/12	0.639		0.088	-0.065	U	0.300	-0.106	U	3.23	0.284		0.145
N-OB-9	J1R0X7	8/30/12	0.838		0.107	0.058	U	0.292	-0.052	U	3.14	0.526		0.192
N-OB-11	J1R0X9	8/30/12	0.883		0.100	-0.034	U	0.289	-0.557	U	3.38	0.690		0.176
N-OB-12	J1R100	8/30/12	0.804		0.203	0.062	U	0.282	0.219	U	3.32	0.632		0.151
S-OB-1	J1R102	8/30/12	0.608		0.067	-0.016	U	0.297	1.18	U	3.12	0.316		0.202
Duplicate of J1R102	J1R114	8/30/12	0.682		0.108	-0.031	U	0.270	-0.712	U	2.90	0.502		0.384
S-OB-2	J1R103	8/30/12	0.916		0.181	0.037	U	0.278	0.885	U	3.38	0.562		0.204
S-OB-3	J1R104	8/30/12	0.750		0.107	-0.072	U	0.306	1.45	U	3.28	0.658		0.187
S-OB-4	J1R105	8/30/12	0.710		0.093	0.047	U	0.297	1.32	U	3.68	0.522		0.235
S-OB-5	J1R106	8/30/12	0.591		0.067	-0.057	U	0.320	-0.581	U	3.23	0.585		0.224
S-OB-6	J1R107	8/30/12	0.750		0.112	-0.147	U	0.275	0.536	U	3.28	0.517		0.188
S-OB-7	J1R108	8/30/12	0.916		0.136	-0.075	U	0.283	-0.293	U	3.58	0.622		0.207
S-OB-8	J1R109	8/30/12	0.782		0.167	-0.006	U	0.272	-0.126	U	3.85	0.512		0.206
S-OB-9	J1R110	8/30/12	0.690		0.085	0.143	U	0.271	-1.21	U	3.53	0.817		0.184
S-OB-10	J1R111	8/30/12	0.605		0.110	-0.071	U	0.302	-0.466	U	3.56	0.688		0.181
S-OB-11	J1R112	8/30/12	0.718		0.080	0.030	U	0.294	0.115	U	3.52	0.588		0.196
S-OB-12	J1R113	8/30/12	0.766		0.108	0.002	U	0.263	0.786	U	3.43	0.605		0.272
FS-1	J1R0V4	9/4/12	0.731		0.090	0.029	U	0.248	4.64	J	3.10	0.444		0.034

Attachment	1	Sheet No.	4 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Radionuclides).

Location	HEIS Number	Sample Date	Uranium-235 (AEA)			Uranium-238 (AEA)			Uranium-235 (GEA)			Uranium-238 (GEA)		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
EXC-9	J1R0V0	8/30/12	0	UJ	0.226	0.610		0.187	0.136	U	0.136	2.23	U	2.23
Duplicate of J1R0V0	J1R0V5	8/30/12	0.094	UJ	0.240	0.674		0.198	0.128	U	0.128	2.60	U	2.60
EXC-1	J1R0T2	8/30/12	0	UJ	0.240	0.414		0.198	0.151	U	0.151	3.23	U	3.23
EXC-2	J1R0T3	8/30/12	0.052	UJ	0.200	0.432		0.165	0.156	U	0.156	3.21	U	3.21
EXC-3	J1R0T4	8/30/12	0.050	UJ	0.192	0.600		0.158	0.155	U	0.155	2.56	U	2.56
EXC-4	J1R0T5	8/30/12	0	UJ	0.197	0.766		0.163	0.392	U	0.392	4.10	U	4.10
EXC-5	J1R0T6	8/30/12	0	UJ	0.206	0.311		0.170	0.311	U	0.311	5.71	U	5.71
EXC-6	J1R0T7	8/30/12	0.029	UJ	0.221	0.715		0.182	0.160	U	0.160	5.19	U	5.19
EXC-7	J1R0T8	8/30/12	0.027	UJ	0.210	0.839		0.174	0.154	U	0.154	3.09	U	3.09
EXC-8	J1R0T9	8/30/12	0.060	UJ	0.230	0.520		0.190	0.164	U	0.164	3.50	U	3.50
EXC-10	J1R0V1	8/30/12	0.095	UJ	0.242	0.602		0.200	0.234	U	0.234	4.12	U	4.12
EXC-11	J1R0V2	8/30/12	0.030	UJ	0.232	0.251		0.192	0.284	U	0.284	5.21	U	5.21
EXC-12	J1R0V3	8/30/12	0.055	UJ	0.211	0.523		0.174	0.174	U	0.174	3.76	U	3.76
SPA-7	J1R0W2	8/29/12	0.088	U	0.225	0.947		0.186	0.129	U	0.129	2.67	U	2.67
Duplicate of J1R0W2	J1R0W8	8/29/12	0.068	U	0.260	0.478		0.215	0.138	U	0.138	2.92	U	2.92
SPA-1	J1R0V6	8/29/12	0.029	U	0.224	0.338		0.185	0.075	U	0.075	0.728	U	0.728
SPA-2	J1R0V7	8/29/12	0.127	U	0.242	1.15		0.200	0.084	U	0.084	1.57	U	1.57
SPA-3	J1R0V8	8/29/12	0.029	U	0.224	0.846		0.185	0.076	U	0.076	1.76	U	1.76
SPA-4	J1R0V9	8/29/12	0.066	U	0.253	0.738		0.209	0.077	U	0.077	0.832	U	0.832
SPA-5	J1R0W0	8/29/12	0.031	U	0.234	0.454		0.193	0.234	U	0.234	4.32	U	4.32
SPA-6	J1R0W1	8/29/12	0	U	0.231	0.598		0.190	0.155	U	0.155	2.98	U	2.98
SPA-8	J1R0W3	8/29/12	0	U	0.205	0.574		0.169	0.175	U	0.175	3.23	U	3.23
SPA-9	J1R0W4	8/29/12	0.034	U	0.264	0.627		0.218	0.128	U	0.128	2.43	U	2.43
SPA-10	J1R0W5	8/29/12	0.091	U	0.175	0.642		0.144	0.166	U	0.166	2.73	U	2.73
SPA-11	J1R0W6	8/29/12	0.034	U	0.263	0.682		0.218	0.175	U	0.175	3.22	U	3.22
SPA-12	J1R0W7	8/29/12	0	U	0.260	0.477		0.215	0.246	U	0.246	4.43	U	4.43
N-OB-10	J1R0X8	8/30/12	0.032	U	0.246	0.612		0.204	0.144	U	0.144	3.17	U	3.17
Duplicate of J1R0X8	J1R101	8/30/12	0	U	0.243	0.394		0.201	0.137	U	0.137	2.78	U	2.78
N-OB-1	J1R0W9	8/30/12	0.029	U	0.223	0.602		0.184	0.075	U	0.075	1.27	U	1.27
N-OB-2	J1R0X0	8/30/12	0	U	0.200	0.367		0.165	0.066	U	0.066	1.39	U	1.39
N-OB-3	J1R0X1	8/30/12	0.112	U	0.214	0.370		0.177	0.084	U	0.084	2.46	U	2.46
N-OB-4	J1R0X2	8/30/12	0.070	U	0.267	0.462		0.221	0.144	U	0.144	2.35	U	2.35
N-OB-5	J1R0X3	8/30/12	0.030	U	0.228	0.566		0.188	0.261	U	0.261	5.43	U	5.43
N-OB-6	J1R1P5	9/4/12	0.033		0.035	0.466		0.037	0.108	U	0.108	2.08	U	2.08
N-OB-7	J1R0X5	8/30/12	0	U	0.207	0.716		0.171	0.128	U	0.128	2.66	U	2.66
N-OB-8	J1R0X6	8/30/12	0.023	U	0.175	0.549		0.145	0.112	U	0.112	2.19	U	2.19
N-OB-9	J1R0X7	8/30/12	0.030	U	0.232	0.275		0.192	0.159	U	0.159	2.97	U	2.97
N-OB-11	J1R0X9	8/30/12	0	U	0.213	0.598		0.176	0.170	U	0.170	2.77	U	2.77
N-OB-12	J1R100	8/30/12	0.024	U	0.183	0.612		0.151	0.286	U	0.286	5.84	U	5.84
S-OB-1	J1R102	8/30/12	0	U	0.244	0.501		0.202	0.138	U	0.138	2.34	U	2.34
Duplicate of J1R102	J1R114	8/30/12	0.061	U	0.465	0.301	U	0.384	0.177	U	0.177	3.32	U	3.32
S-OB-2	J1R103	8/30/12	0.065	U	0.248	0.214		0.204	0.276	U	0.276	5.33	U	5.33
S-OB-3	J1R104	8/30/12	0.030	U	0.226	0.683		0.187	0.148	U	0.148	2.84	U	2.84
S-OB-4	J1R105	8/30/12	0	U	0.284	0.430		0.235	0.146	U	0.146	2.85	U	2.85
S-OB-5	J1R106	8/30/12	0	U	0.271	0.439		0.224	0.142	U	0.142	2.28	U	2.28
S-OB-6	J1R107	8/30/12	0.060	U	0.228	0.566		0.188	0.163	U	0.163	2.90	U	2.90
S-OB-7	J1R108	8/30/12	0.065	U	0.250	0.594		0.207	0.199	U	0.199	4.01	U	4.01
S-OB-8	J1R109	8/30/12	0.033	U	0.249	0.566		0.206	0.278	U	0.278	5.15	U	5.15
S-OB-9	J1R110	8/30/12	0.058	U	0.223	0.481		0.184	0.133	U	0.133	2.80	U	2.80
S-OB-10	J1R111	8/30/12	0	U	0.220	0.664		0.181	0.133	U	0.133	3.09	U	3.09
S-OB-11	J1R112	8/30/12	0	U	0.237	0.409		0.196	0.145	U	0.145	3.45	U	3.45
S-OB-12	J1R113	8/30/12	0.043	U	0.330	0.463		0.272	0.154	U	0.154	2.69	U	2.69
FS-1	J1R0V4	9/4/12	0.030	J	0.026	0.452		0.031	0.148	U	0.148	2.72	U	2.72

Attachment	1	Sheet No.	5 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	6320	J	11.4	1.37	UJ	1.37	2.48		2.28	71.6		1.14	0.260	B	0.456
Duplicate of J1R0V0	J1R0V5	8/30/12	5990	J	13.3	1.59	UJ	1.59	2.21	B	2.65	66.1		1.33	0.241	B	0.531
EXC-1	J1R0T2	8/30/12	7760	J	12.6	1.52	UJ	1.52	2.50	B	2.53	74.9		1.26	0.308	B	0.506
EXC-2	J1R0T3	8/30/12	7450	J	13.0	1.56	UJ	1.56	2.70		2.60	70.7		1.30	0.289	B	0.520
EXC-3	J1R0T4	8/30/12	6260	J	13.0	1.56	UJ	1.56	2.38	B	2.60	60.0		1.30	0.254	B	0.519
EXC-4	J1R0T5	8/30/12	8080	J	13.0	1.56	UJ	1.56	2.56	B	2.59	82.6		1.30	0.323	B	0.519
EXC-5	J1R0T6	8/30/12	7700	J	13.4	1.61	UJ	1.61	3.04		2.68	78.6		1.34	0.335	B	0.536
EXC-6	J1R0T7	8/30/12	8130	J	12.8	1.53	UJ	1.53	2.93		2.55	81.7		1.28	0.352	B	0.510
EXC-7	J1R0T8	8/30/12	7760	J	12.3	1.48	UJ	1.48	2.74		2.46	80.6		1.23	0.332	B	0.493
EXC-8	J1R0T9	8/30/12	7790	J	12.8	1.53	UJ	1.53	2.64		2.55	82.4		1.28	0.311	B	0.510
EXC-10	J1R0V1	8/30/12	8050	J	12.5	1.50	UJ	1.50	2.71		2.51	80.7		1.25	0.322	B	0.502
EXC-11	J1R0V2	8/30/12	6460	J	12.1	1.45	UJ	1.45	2.32	B	2.42	68.8		1.21	0.281	B	0.485
EXC-12	J1R0V3	8/30/12	6790	J	13.5	1.62	UJ	1.62	3.02		2.69	62.0		1.35	0.266	B	0.539
SPA-7	J1R0W2	8/29/12	7740		10.8	1.30	U	1.30	2.91		2.17	73.9		1.08	0.291	B	0.433
Duplicate of J1R0W2	J1R0W8	8/29/12	7190		12.8	1.54	U	1.54	2.89		2.57	79.1		1.28	0.272	B	0.513
SPA-1	J1R0V6	8/29/12	6740		13.5	1.62	U	1.62	2.23	B	2.69	64.7		1.35	0.266	B	0.539
SPA-2	J1R0V7	8/29/12	6860		14.2	1.71	U	1.71	2.72	B	2.85	61.9		1.42	0.267	B	0.570
SPA-3	J1R0V8	8/29/12	7600		13.4	1.61	U	1.61	2.92		2.69	61.6		1.34	0.268	B	0.538
SPA-4	J1R0V9	8/29/12	6980		14.6	1.75	U	1.75	2.60	B	2.92	65.3		1.46	0.274	B	0.585
SPA-5	J1R0W0	8/29/12	6230		12.8	1.53	U	1.53	3.13		2.56	66.0		1.28	0.245	B	0.512
SPA-6	J1R0W1	8/29/12	6600		13.0	1.56	U	1.56	2.51	B	2.60	59.8		1.30	0.264	B	0.520
SPA-8	J1R0W3	8/29/12	7510		13.0	0.987	B	1.56	4.04		2.60	66.9		1.30	0.268	B	0.521
SPA-9	J1R0W4	8/29/12	6940		12.8	1.54	U	1.54	2.55	B	2.57	61.8		1.28	0.269	B	0.514
SPA-10	J1R0W5	8/29/12	9650		12.8	1.54	U	1.54	3.37		2.56	82.2		1.28	0.342	B	0.512
SPA-11	J1R0W6	8/29/12	6450		12.4	1.49	U	1.49	2.81		2.49	60.9		1.24	0.241	B	0.497
SPA-12	J1R0W7	8/29/12	7630		14.3	1.72	U	1.72	2.83	B	2.86	61.4		1.43	0.268	B	0.573
N-OB-10	J1R0X8	8/30/12	7810		4.56	0.547	U	0.547	2.49		0.911	68.9		0.456	0.285		0.182
Duplicate of J1R0X8	J1R101	8/30/12	7630		4.47	0.537	U	0.537	2.62		0.894	67.3		0.447	0.280		0.179
N-OB-1	J1R0W9	8/30/12	7750		4.40	0.528	U	0.528	2.75		0.881	62.1		0.440	0.269		0.176
N-OB-2	J1R0X0	8/30/12	6810		4.49	0.539	U	0.539	2.21		0.899	78.4		0.449	0.262		0.180
N-OB-3	J1R0X1	8/30/12	6890		4.39	0.527	U	0.527	2.32		0.879	62.3		0.439	0.264		0.176
N-OB-4	J1R0X2	8/30/12	6320		4.56	0.547	U	0.547	2.32		0.912	60.1		0.456	0.245		0.182
N-OB-5	J1R0X3	8/30/12	7670		4.04	0.485	U	0.485	2.90		0.809	64.9		0.404	0.268		0.162
N-OB-6	J1R1P5	9/4/12	7330		13.0	1.56	U	1.56	2.63		2.61	60.9		1.30	0.289	B	0.521
N-OB-7	J1R0X5	8/30/12	5810		4.32	0.518	U	0.518	1.97		0.864	64.3		0.432	0.231		0.173
N-OB-8	J1R0X6	8/30/12	5930		4.05	0.486	U	0.486	1.90		0.810	55.3		0.405	0.242		0.162
N-OB-9	J1R0X7	8/30/12	6190		4.64	0.557	U	0.557	2.41		0.928	67.2		0.464	0.242		0.186
N-OB-11	J1R0X9	8/30/12	8780		4.73	0.568	U	0.568	2.79		0.947	78.0		0.473	0.305		0.189
N-OB-12	J1R100	8/30/12	7870		4.65	0.558	U	0.558	2.78		0.930	72.0		0.465	0.284		0.186
S-OB-1	J1R102	8/30/12	8490		4.75	0.570	U	0.570	3.04		0.950	66.5		0.475	0.316		0.190
Duplicate of J1R102	J1R114	8/30/12	7880		4.74	0.569	U	0.569	3.02		0.949	65.0		0.474	0.312		0.190
S-OB-2	J1R103	8/30/12	7860		4.84	0.580	U	0.580	3.14		0.967	85.3		0.484	0.315		0.193
S-OB-3	J1R104	8/30/12	7320		5.00	0.600	U	0.600	2.51		1.00	59.5		0.500	0.284		0.200
S-OB-4	J1R105	8/30/12	8940		4.68	0.562	U	0.562	3.83		0.936	70.3		0.468	0.332		0.187
S-OB-5	J1R106	8/30/12	8030		4.83	0.580	U	0.580	2.39		0.967	63.7		0.483	0.319		0.193
S-OB-6	J1R107	8/30/12	7990		4.92	0.591	U	0.591	2.78		0.985	69.4		0.492	0.296		0.197
S-OB-7	J1R108	8/30/12	7660		5.01	0.602	U	0.602	2.86		1.00	69.3		0.501	0.306		0.201
S-OB-8	J1R109	8/30/12	6550		4.49	0.539	U	0.539	2.19		0.899	56.4		0.449	0.267		0.180
S-OB-9	J1R110	8/30/12	7920		4.92	0.591	U	0.591	2.68		0.985	66.0		0.492	0.292		0.197
S-OB-10	J1R111	8/30/12	8000		5.02	0.603	U	0.603	2.89		1.00	63.7		0.502	0.304		0.201
S-OB-11	J1R112	8/30/12	7370		4.73	0.568	U	0.568	2.26		0.946	63.0		0.473	0.263		0.189
S-OB-12	J1R113	8/30/12	8020		4.73	0.567	U	0.567	3.17		0.945	69.6		0.473	0.291		0.189
FS-1	J1R0V4	9/4/12	7890	J	14.6	1.75	UJ	1.75	2.87	B	2.91	99.9		1.46	0.302	B	0.583
Equipment Blank	J1R115	8/30/12	247		4.63	0.556	U	0.556	0.926	U	0.926	2.11		0.463	0.185	U	0.185

Attachment	1	Sheet No.	6 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	4.56	U	4.56	0.456	U	0.456	6940	J	228	9.51		0.456	7.58		4.56
Duplicate of J1R0V0	J1R0V5	8/30/12	5.31	U	5.31	0.531	U	0.531	6200	J	265	7.52		0.531	7.28		5.31
EXC-1	J1R0T2	8/30/12	1.44	B	5.06	0.506	U	0.506	6400	J	253	9.09		0.506	7.97		5.06
EXC-2	J1R0T3	8/30/12	1.38	B	5.20	0.520	U	0.520	6590	J	260	9.42		0.520	8.45		5.20
EXC-3	J1R0T4	8/30/12	5.19	U	5.19	0.519	U	0.519	6940	J	260	8.61		0.519	8.51		5.19
EXC-4	J1R0T5	8/30/12	1.45	B	5.19	0.519	U	0.519	5370	J	259	8.98		0.519	8.67		5.19
EXC-5	J1R0T6	8/30/12	1.49	B	5.36	0.536	U	0.536	7800	J	268	10.3		0.536	7.97		5.36
EXC-6	J1R0T7	8/30/12	1.61	B	5.10	0.510	U	0.510	7220	J	255	10.4		0.510	7.80		5.10
EXC-7	J1R0T8	8/30/12	1.44	B	4.93	0.493	U	0.493	6640	J	246	8.96		0.493	8.21		4.93
EXC-8	J1R0T9	8/30/12	1.39	B	5.10	0.510	U	0.510	8590	J	255	10.0		0.510	7.98		5.10
EXC-10	J1R0V1	8/30/12	1.55	B	5.02	0.502	U	0.502	7180	J	251	10.1		0.502	8.31		5.02
EXC-11	J1R0V2	8/30/12	4.85	U	4.85	0.485	U	0.485	6580	J	242	7.11		0.485	8.32		4.85
EXC-12	J1R0V3	8/30/12	5.39	U	5.39	0.539	U	0.539	8800	J	269	9.13		0.539	7.13		5.39
SPA-7	J1R0W2	8/29/12	2.58	B	4.33	0.162	B	0.433	8370		217	10.2		0.433	7.49		4.33
Duplicate of J1R0W2	J1R0W8	8/29/12	2.51	B	5.13	0.171	B	0.513	8690		257	9.15		0.513	7.92		5.13
SPA-1	J1R0V6	8/29/12	1.50	B	5.39	0.539	U	0.539	6340		269	9.14		0.539	7.86		5.39
SPA-2	J1R0V7	8/29/12	1.71	B	5.70	0.570	U	0.570	7390		285	10.2		0.570	7.72		5.70
SPA-3	J1R0V8	8/29/12	1.74	B	5.38	0.538	U	0.538	7950		269	10.2		0.538	7.07		5.38
SPA-4	J1R0V9	8/29/12	2.46	B	5.85	0.166	B	0.585	8280		292	9.27		0.585	7.96		5.85
SPA-5	J1R0W0	8/29/12	1.67	B	5.12	0.149	B	0.512	6680		256	8.06		0.512	7.98		5.12
SPA-6	J1R0W1	8/29/12	1.37	B	5.20	0.520	U	0.520	7830		260	8.66		0.520	7.47		5.20
SPA-8	J1R0W3	8/29/12	1.86	B	5.21	0.237	B	0.521	6850		260	10.1		0.521	7.33		5.21
SPA-9	J1R0W4	8/29/12	5.14	U	5.14	0.514	U	0.514	7070		257	8.49		0.514	8.02		5.14
SPA-10	J1R0W5	8/29/12	2.04	B	5.12	0.512	U	0.512	4890		256	13.2		0.512	7.57		5.12
SPA-11	J1R0W6	8/29/12	4.97	U	4.97	0.497	U	0.497	7570		249	9.08		0.497	7.76		4.97
SPA-12	J1R0W7	8/29/12	1.59	B	5.73	0.573	U	0.573	7560		286	10.3		0.573	7.92		5.73
N-OB-10	J1R0X8	8/30/12	1.47	B	1.82	0.110	B	0.182	7700		91.1	9.78		0.182	7.33		1.82
Duplicate of J1R0X8	J1R101	8/30/12	2.53		1.79	0.098	B	0.179	7700		89.4	8.70		0.179	7.90		1.79
N-OB-1	J1R0W9	8/30/12	1.20	B	1.76	0.0984	B	0.176	7260		88.1	8.85		0.176	7.33		1.76
N-OB-2	J1R0X0	8/30/12	0.875	B	1.80	0.0983	B	0.180	7340		89.9	7.77		0.180	7.9		1.80
N-OB-3	J1R0X1	8/30/12	1.28	B	1.76	0.111	B	0.176	7220		87.9	8.94		0.176	6.95		1.76
N-OB-4	J1R0X2	8/30/12	0.985	B	1.82	0.0977	B	0.182	8140		91.2	7.85		0.182	7.47		1.82
N-OB-5	J1R0X3	8/30/12	1.32	B	1.62	0.0972	B	0.162	9410		80.9	10.6		0.162	6.97		1.62
N-OB-6	J1R1P5	9/4/12	1.52	B	5.21	0.521	U	0.521	7510		261	9.13		0.521	8.57		5.21
N-OB-7	J1R0X5	8/30/12	0.951	B	1.73	0.0981	B	0.173	7700		86.4	5.75		0.173	8.54		1.73
N-OB-8	J1R0X6	8/30/12	0.852	B	1.62	0.111	B	0.162	6780		81.0	6.59		0.162	9.08		1.62
N-OB-9	J1R0X7	8/30/12	1.14	B	1.86	0.106	B	0.186	8290		92.8	6.31		0.186	8.03		1.86
N-OB-11	J1R0X9	8/30/12	2.47		1.89	0.121	B	0.189	6100		94.7	11.1		0.189	7.82		1.89
N-OB-12	J1R100	8/30/12	2.54		1.86	0.114	B	0.186	7030		93.0	9.49		0.186	7.99		1.86
S-OB-1	J1R102	8/30/12	2.66		1.90	0.109	B	0.190	9470		95.0	9.29		0.190	7.42		1.90
Duplicate of J1R102	J1R114	8/30/12	1.34	B	1.90	0.108	B	0.190	8940		94.9	9.59		0.190	7.95		1.90
S-OB-2	J1R103	8/30/12	2.97		1.93	0.131	B	0.193	7550		96.7	10.5		0.193	7.35		1.93
S-OB-3	J1R104	8/30/12	1.55	B	2.00	0.111	B	0.200	7840		100	8.20		0.200	6.73		2.00
S-OB-4	J1R105	8/30/12	1.43	B	1.87	0.124	B	0.187	8960		93.6	11.3		0.187	8.96		1.87
S-OB-5	J1R106	8/30/12	1.32	B	1.93	0.108	B	0.193	7200		96.7	9.70		0.193	7.67		1.93
S-OB-6	J1R107	8/30/12	1.90	B	1.97	0.115	B	0.197	8830		98.5	9.62		0.197	7.36		1.97
S-OB-7	J1R108	8/30/12	1.28	B	2.01	0.102	B	0.201	7600		100	8.78		0.201	8.22		2.01
S-OB-8	J1R109	8/30/12	0.878	B	1.80	0.0973	B	0.180	7260		89.9	6.15		0.180	8.57		1.80
S-OB-9	J1R110	8/30/12	1.34	B	1.97	0.117	B	0.197	8900		98.5	9.91		0.197	7.32		1.97
S-OB-10	J1R111	8/30/12	1.23	B	2.01	0.111	B	0.201	8490		100	9.63		0.201	8.02		2.01
S-OB-11	J1R112	8/30/12	1.34	B	1.89	0.109	B	0.189	7430		94.6	8.69		0.189	7.10		1.89
S-OB-12	J1R113	8/30/12	2.84		1.89	0.125	B	0.189	8240		94.5	10.5		0.189	7.07		1.89
FS-1	J1R0V4	9/4/12	2.25	B	5.83	0.583	U	0.583	8540	J	291	8.54		0.583	8.59		5.83
Equipment Blank	J1R115	8/30/12	1.85	U	1.85	0.185	U	0.185	52.1	B	92.6	0.185	U	0.185	1.85	U	1.85

Attachment	1	Sheet No.	7 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Copper			Hexavalent Chromium			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	12.9		2.28	0.20	U	0.20	23400		45.6	3.47		1.14	4620		171
Duplicate of J1R0V0	J1R0V5	8/30/12	12.7		2.65	0.20	U	0.20	22200		53.1	3.25		1.33	4310		199
EXC-1	J1R0T2	8/30/12	14.4		2.53	0.20	U	0.20	26300		50.6	3.96		1.26	4950		190
EXC-2	J1R0T3	8/30/12	14.8		2.60	0.20	U	0.20	25400		52.0	3.91		1.30	4970		195
EXC-3	J1R0T4	8/30/12	14.6		2.60	0.20	U	0.20	25200		51.9	3.30		1.30	4740		195
EXC-4	J1R0T5	8/30/12	15.3		2.59	0.20	U	0.20	26300		51.9	4.74		1.30	4640		195
EXC-5	J1R0T6	8/30/12	14.1		2.68	0.20	U	0.20	25100		53.6	4.64		1.34	5010		201
EXC-6	J1R0T7	8/30/12	14.1		2.55	0.20	U	0.20	24500		51.0	4.40		1.28	4840		191
EXC-7	J1R0T8	8/30/12	13.8		2.46	0.20	U	0.20	25700		49.3	4.44		1.23	4920		185
EXC-8	J1R0T9	8/30/12	13.5		2.55	0.20	U	0.20	24900		51.0	4.11		1.28	5120		191
EXC-10	J1R0V1	8/30/12	14.3		2.51	0.20	U	0.20	26000		50.2	4.34		1.25	4910		188
EXC-11	J1R0V2	8/30/12	14.7		2.42	0.20	U	0.20	26800		48.5	3.62		1.21	4670		182
EXC-12	J1R0V3	8/30/12	13.6		2.69	0.20	U	0.20	21300		53.9	3.79		1.35	4490		202
SPA-7	J1R0W2	8/29/12	15.6		2.17	0.20	U	0.20	22300		43.3	8.81		1.08	4710		162
Duplicate of J1R0W2	J1R0W8	8/29/12	16.1		2.57	0.20	U	0.20	24100		51.3	8.74		1.28	4520		193
SPA-1	J1R0V6	8/29/12	14.2		2.69	0.20	U	0.20	25600		53.9	4.75		1.35	4850		202
SPA-2	J1R0V7	8/29/12	14.5		2.85	0.20	U	0.20	23300		57.0	4.53		1.42	4600		214
SPA-3	J1R0V8	8/29/12	14.5		2.69	0.20	U	0.20	21600		53.8	4.63		1.34	4330		202
SPA-4	J1R0V9	8/29/12	16.6		2.92	0.20	U	0.20	24800		58.5	6.77		1.46	4700		219
SPA-5	J1R0W0	8/29/12	16.9		2.56	0.20	U	0.20	23500		51.2	5.41		1.28	4420		192
SPA-6	J1R0W1	8/29/12	13.8		2.60	0.20	U	0.20	23400		52.0	3.73		1.30	4500		195
SPA-8	J1R0W3	8/29/12	16.8		2.60	0.20	U	0.20	22100		52.1	8.81		1.30	4390		195
SPA-9	J1R0W4	8/29/12	14.4		2.57	0.20	U	0.20	23900		51.4	4.07		1.28	4640		193
SPA-10	J1R0W5	8/29/12	14.6		2.56	0.20	U	0.20	23000		51.2	4.70		1.28	4660		192
SPA-11	J1R0W6	8/29/12	14.7		2.49	0.20	U	0.20	23100		49.7	3.92		1.24	4410		186
SPA-12	J1R0W7	8/29/12	15.3		2.86	0.20	U	0.20	23800		57.3	4.03		1.43	4830		215
N-OB-10	J1R0X8	8/30/12	15.3		0.911	0.20	U	0.20	25400		18.2	3.52		0.456	4880		68.3
Duplicate of J1R0X8	J1R101	8/30/12	15.2		0.894	0.20	U	0.20	25800		17.9	3.48		0.447	5160		67.1
N-OB-1	J1R0W9	8/30/12	15.7		0.881	0.20	U	0.20	25100		17.6	3.75		0.44	5320		66.1
N-OB-2	J1R0X0	8/30/12	16.1		0.899	0.20	U	0.20	25900		18.0	3.25		0.449	5120		67.4
N-OB-3	J1R0X1	8/30/12	13.6		0.879	0.20	U	0.20	23500		17.6	4.05		0.439	4900		65.9
N-OB-4	J1R0X2	8/30/12	13.8		0.912	0.20	U	0.20	24400		18.2	3.18		0.456	4790		68.4
N-OB-5	J1R0X3	8/30/12	15.6		0.809	0.20	U	0.20	22800		16.2	3.45		0.404	5120		60.7
N-OB-6	J1R1P5	9/4/12	15.1		2.61	0.20	U	0.20	27100		52.1	3.44		1.30	5200		195
N-OB-7	J1R0X5	8/30/12	14.2		0.864	0.20	U	0.20	28000		17.3	2.99		0.432	5150		64.8
N-OB-8	J1R0X6	8/30/12	14.8		0.810	0.20	U	0.20	26700		16.2	3.04		0.405	5190		60.8
N-OB-9	J1R0X7	8/30/12	15.6		0.928	0.20	U	0.20	28800		18.6	3.08		0.464	5190		69.6
N-OB-11	J1R0X9	8/30/12	15.3		0.947	0.20	U	0.20	24300		18.9	4.15		0.473	5010		71.00
N-OB-12	J1R100	8/30/12	15.2		0.930	0.20	U	0.20	24800		18.6	3.91		0.465	5110		69.8
S-OB-1	J1R102	8/30/12	15.9		0.950	0.20	U	0.20	25300		19.0	4.15		0.475	5540		71.2
Duplicate of J1R102	J1R114	8/30/12	15.8		0.949	0.20	U	0.20	24200		19.0	4.73		0.474	5180		71.2
S-OB-2	J1R103	8/30/12	15.8		0.967	0.20	U	0.20	24400		19.3	5.47		0.484	5560		72.5
S-OB-3	J1R104	8/30/12	14.2		1.00	0.20	U	0.20	22800		20.0	3.85		0.500	4760		75.00
S-OB-4	J1R105	8/30/12	17.8		0.936	0.20	U	0.20	26100		18.7	4.34		0.468	5800		70.2
S-OB-5	J1R106	8/30/12	16.0		0.967	0.20	U	0.20	25700		19.3	3.62		0.483	5430		72.5
S-OB-6	J1R107	8/30/12	15.3		0.985	0.20	U	0.20	24700		19.7	4.01		0.492	5320		73.9
S-OB-7	J1R108	8/30/12	15.6		1.00	0.20	U	0.20	25900		20.1	3.82		0.501	5310		75.2
S-OB-8	J1R109	8/30/12	17.5		0.899	0.20	U	0.20	25400		18.0	3.14		0.449	5440		67.4
S-OB-9	J1R110	8/30/12	15.7		0.985	0.20	U	0.20	24700		19.7	4.14		0.492	5100		73.9
S-OB-10	J1R111	8/30/12	15.5		1.00	0.20	U	0.20	25200		20.1	3.77		0.502	5210		75.3
S-OB-11	J1R112	8/30/12	15.3		0.946	0.20	U	0.20	22900		18.9	3.86		0.473	4780		71.00
S-OB-12	J1R113	8/30/12	15.4		0.945	0.20	U	0.20	21700		18.9	4.67		0.473	4960		70.9
FS-1	J1R0V4	9/4/12	15.8		2.91	0.21	U	0.21	26600		58.3	3.88		1.46	4910		219
Equipment Blank	J1R115	8/30/12	0.926	U	0.926				453		18.5	0.621		0.463	30.7	B	69.4

Attachment	1	Sheet No.	8 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Manganese			Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	331		11.4	0.0237	U	0.0237	4.56	U	4.56	10.4		9.11	1060		911
Duplicate of J1R0V0	J1R0V5	8/30/12	312		13.3	0.0239	U	0.0239	5.31	U	5.31	8.81	B	10.6	993	B	1060
EXC-1	J1R0T2	8/30/12	375		12.6	0.0268	U	0.0268	5.06	U	5.06	10.2		10.1	1390		1010
EXC-2	J1R0T3	8/30/12	366		13.0	0.0238	U	0.0238	0.561	B	5.20	9.85	B	10.4	1310		1040
EXC-3	J1R0T4	8/30/12	329		13.0	0.0266	U	0.0266	5.19	U	5.19	9.04	B	10.4	983	B	1040
EXC-4	J1R0T5	8/30/12	355		13.0	0.0258	U	0.0258	5.19	U	5.19	9.91	B	10.4	1470		1040
EXC-5	J1R0T6	8/30/12	339		13.4	0.0273	U	0.0273	5.36	U	5.36	10.2	B	10.7	1350		1070
EXC-6	J1R0T7	8/30/12	341		12.8	0.0238	U	0.0238	5.10	U	5.10	10.3		10.2	1480		1020
EXC-7	J1R0T8	8/30/12	360		12.3	0.0258	U	0.0258	4.93	U	4.93	10.1		9.86	1410		986
EXC-8	J1R0T9	8/30/12	347		12.8	0.0232	U	0.0232	5.10	U	5.10	11.9		10.2	1390		1020
EXC-10	J1R0V1	8/30/12	359		12.5	0.0266	U	0.0266	5.02	U	5.02	10.5		10.0	1450		1000
EXC-11	J1R0V2	8/30/12	345		12.1	0.0244	U	0.0244	4.85	U	4.85	8.83	B	9.69	1090		969
EXC-12	J1R0V3	8/30/12	312		13.5	0.0251	U	0.0251	5.39	U	5.39	9.24	B	10.8	1210		1080
SPA-7	J1R0W2	8/29/12	326		10.8	0.0430		0.0268	0.483	B	4.33	11.1		8.67	1360		867
Duplicate of J1R0W2	J1R0W8	8/29/12	341		12.8	0.0275	U	0.0275	5.13	U	5.13	9.78	B	10.3	1310		1030
SPA-1	J1R0V6	8/29/12	362		13.5	0.0251	U	0.0251	0.567	B	5.39	10.5	B	10.8	1020	B	1080
SPA-2	J1R0V7	8/29/12	318		14.2	0.0275	U	0.0275	0.652	B	5.70	10.1	B	11.4	1160		1140
SPA-3	J1R0V8	8/29/12	301		13.4	0.0266	U	0.0266	5.38	U	5.38	10.9		10.8	1200		1080
SPA-4	J1R0V9	8/29/12	339		14.6	0.0261	U	0.0261	5.85	U	5.85	9.84	B	11.7	1240		1170
SPA-5	J1R0W0	8/29/12	314		12.8	0.0259	U	0.0259	0.626	B	5.12	10.2	B	10.2	955	B	1020
SPA-6	J1R0W1	8/29/12	306		13.0	0.0232	U	0.0232	5.20	U	5.20	9.45	B	10.4	1030	B	1040
SPA-8	J1R0W3	8/29/12	312		13.0	0.0238	U	0.0238	5.21	U	5.21	9.84	B	10.4	1210		1040
SPA-9	J1R0W4	8/29/12	348		12.8	0.0260	U	0.0260	5.14	U	5.14	9.58	B	10.3	1220		1030
SPA-10	J1R0W5	8/29/12	359		12.8	0.0275	U	0.0275	5.12	U	5.12	11.5		10.2	1720		1020
SPA-11	J1R0W6	8/29/12	311		12.4	0.0268	U	0.0268	4.97	U	4.97	10.2		9.94	925	B	994
SPA-12	J1R0W7	8/29/12	322		14.3	0.0253	U	0.0253	5.73	U	5.73	11.1	B	11.5	1160		1150
N-OB-10	J1R0X8	8/30/12	358		4.56	0.0291	U	0.0291	0.368	B	1.82	9.37		3.64	1320		364
Duplicate of J1R0X8	J1R101	8/30/12	363		4.47	0.0282	U	0.0282	0.367	B	1.79	10.8		3.58	1320		358
N-OB-1	J1R0W9	8/30/12	343		4.40	0.0258	U	0.0258	0.438	B	1.76	10.7		3.52	1170		352
N-OB-2	J1R0X0	8/30/12	344		4.49	0.0275	U	0.0275	0.487	B	1.80	10.7		3.60	973		360
N-OB-3	J1R0X1	8/30/12	302		4.39	0.0244	U	0.0244	0.373	B	1.76	10.3		3.52	1060		352
N-OB-4	J1R0X2	8/30/12	326		4.56	0.0244	U	0.0244	0.366	B	1.82	9.53		3.65	968		365
N-OB-5	J1R0X3	8/30/12	315		4.04	0.0244	U	0.0244	0.417	B	1.62	18.2		3.24	1210		324
N-OB-6	J1R1P5	9/4/12	384		13.0	0.0259	U	0.0259	5.21	U	5.21	11.9		10.4	1150		1040
N-OB-7	J1R0X5	8/30/12	362		4.32	0.0237	U	0.0237	0.444	B	1.73	8.59		3.45	946		345
N-OB-8	J1R0X6	8/30/12	347		4.05	0.0266	U	0.0266	0.426	B	1.62	10.1		3.24	849		324
N-OB-9	J1R0X7	8/30/12	379		4.64	0.0291	U	0.0291	0.440	B	1.86	9.56		3.71	1030		371
N-OB-11	J1R0X9	8/30/12	352		4.73	0.0251	U	0.0251	0.383	B	1.89	11.8		3.79	2170		379
N-OB-12	J1R100	8/30/12	353		4.65	0.0251	U	0.0251	0.353	B	1.86	10.4		3.72	1830		372
S-OB-1	J1R102	8/30/12	373		4.75	0.0283	U	0.0283	0.432	B	1.90	11.7		3.80	1360		380
Duplicate of J1R102	J1R114	8/30/12	347		4.74	0.0266	U	0.0266	0.368	B	1.90	10.8		3.80	1310		380
S-OB-2	J1R103	8/30/12	362		4.84	0.0308		0.0292	0.702	B	1.93	14.8		3.87	1350		387
S-OB-3	J1R104	8/30/12	332		5.00	0.0287	U	0.0287	0.393	B	2.00	9.31		4.00	1260		400
S-OB-4	J1R105	8/30/12	391		4.68	0.0293	U	0.0293	0.512	B	1.87	12.8		3.74	1500		374
S-OB-5	J1R106	8/30/12	367		4.83	0.0274	U	0.0274	0.432	B	1.93	12.0		3.87	1340		387
S-OB-6	J1R107	8/30/12	359		4.92	0.0283	U	0.0283	0.428	B	1.97	12.0		3.94	1280		394
S-OB-7	J1R108	8/30/12	371		5.01	0.0282	U	0.0282	0.395	B	2.01	10.6		4.01	1400		401
S-OB-8	J1R109	8/30/12	346		4.49	0.0283	U	0.0283	0.417	B	1.80	12.3		3.60	1040		360
S-OB-9	J1R110	8/30/12	353		4.92	0.0283	U	0.0283	0.374	B	1.97	9.96		3.94	1290		394
S-OB-10	J1R111	8/30/12	366		5.02	0.0274	U	0.0274	0.423	B	2.01	11.1		4.02	1320		402
S-OB-11	J1R112	8/30/12	309		4.73	0.0274	U	0.0274	0.378	B	1.89	10.3		3.79	1110		379
S-OB-12	J1R113	8/30/12	308		4.73	0.0273	U	0.0273	0.329	B	1.89	11.1		3.78	1450		378
FS-1	J1R0V4	9/4/12	344		14.6	0.0255	U	0.0255	5.83	U	5.83	10.7	B	11.7	1230		1170
Equipment Blank	J1R115	8/30/12	7.03		4.63	0.0273	U	0.0273	1.85	U	1.85	3.70	U	3.70	52.8	B	370

Attachment	1	Sheet No.	9 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	0.684	U	0.684	590		4.56	0.456	U	0.456	291		114	64.4		5.70
Duplicate of J1R0V0	J1R0V5	8/30/12	0.796	U	0.796	349		5.31	0.531	U	0.531	271		133	62.6		6.63
EXC-1	J1R0T2	8/30/12	0.758	U	0.758	514		5.06	0.506	U	0.506	340		126	68.5		6.32
EXC-2	J1R0T3	8/30/12	0.780	U	0.780	552		5.20	0.520	U	0.520	338		130	66.1		6.50
EXC-3	J1R0T4	8/30/12	0.779	U	0.779	405		5.19	0.519	U	0.519	288		130	70.1		6.49
EXC-4	J1R0T5	8/30/12	0.778	U	0.778	682		5.19	0.519	U	0.519	331		130	66.1		6.48
EXC-5	J1R0T6	8/30/12	0.805	U	0.805	834		5.36	0.536	U	0.536	300		134	65.4		6.71
EXC-6	J1R0T7	8/30/12	0.766	U	0.766	813		5.10	0.510	U	0.510	292		128	62.4		6.38
EXC-7	J1R0T8	8/30/12	0.739	U	0.739	745		4.93	0.493	U	0.493	301		123	64.6		6.16
EXC-8	J1R0T9	8/30/12	0.766	U	0.766	747		5.10	0.510	U	0.510	308		128	66.7		6.38
EXC-10	J1R0V1	8/30/12	0.752	U	0.752	796		5.02	0.502	U	0.502	333		125	69.4		6.27
EXC-11	J1R0V2	8/30/12	0.727	U	0.727	660		4.85	0.485	U	0.485	330		121	72.3		6.06
EXC-12	J1R0V3	8/30/12	0.808	U	0.808	719		5.39	0.539	U	0.539	303		135	56.9		6.73
SPA-7	J1R0W2	8/29/12	0.650	U	0.650	950		4.33	0.433	U	0.433	317		108	56.7		5.42
Duplicate of J1R0W2	J1R0W8	8/29/12	0.770	U	0.770	958		5.13	0.513	U	0.513	308		128	63.6		6.42
SPA-1	J1R0V6	8/29/12	0.808	U	0.808	712		5.39	0.539	U	0.539	331		135	70.7		6.73
SPA-2	J1R0V7	8/29/12	0.855	U	0.855	930		5.70	0.570	U	0.570	269		142	64.4		7.12
SPA-3	J1R0V8	8/29/12	0.807	U	0.807	985		5.38	0.538	U	0.538	337		134	56.8		6.72
SPA-4	J1R0V9	8/29/12	0.877	U	0.877	611		5.85	0.585	U	0.585	303		146	68.1		7.31
SPA-5	J1R0W0	8/29/12	0.767	U	0.767	629		5.12	0.512	U	0.512	321		128	55.2		6.40
SPA-6	J1R0W1	8/29/12	0.781	U	0.781	792		5.20	0.520	U	0.520	280		130	63.0		6.51
SPA-8	J1R0W3	8/29/12	0.781	U	0.781	826		5.21	0.521	U	0.521	278		130	55.3		6.51
SPA-9	J1R0W4	8/29/12	0.771	U	0.771	695		5.14	0.514	U	0.514	301		128	63.8		6.42
SPA-10	J1R0W5	8/29/12	0.768	U	0.768	882		5.12	0.512	U	0.512	229		128	56.3		6.40
SPA-11	J1R0W6	8/29/12	0.746	U	0.746	743		4.97	0.497	U	0.497	273		124	65.4		6.21
SPA-12	J1R0W7	8/29/12	0.859	U	0.859	775		5.73	0.573	U	0.573	395		143	64.5		7.16
N-OB-10	J1R0X8	8/30/12	0.273	U	0.273	705		1.82	0.182	U	0.182	335		45.6	76.1		2.28
Duplicate of J1R0X8	J1R101	8/30/12	0.268	U	0.268	746		1.79	0.179	U	0.179	299		44.7	75.7		2.24
N-OB-1	J1R0W9	8/30/12	0.264	U	0.264	639		1.76	0.176	U	0.176	317		44.0	72.0		2.20
N-OB-2	J1R0X0	8/30/12	0.270	U	0.270	474		1.80	0.180	U	0.180	348		44.9	76.0		2.25
N-OB-3	J1R0X1	8/30/12	0.264	U	0.264	549		1.76	0.176	U	0.176	337		43.9	69.4		2.20
N-OB-4	J1R0X2	8/30/12	0.273	U	0.273	603		1.82	0.182	U	0.182	309		45.6	74.1		2.28
N-OB-5	J1R0X3	8/30/12	0.243	U	0.243	727		1.62	0.162	U	0.162	301		40.4	66.1		2.02
N-OB-6	J1R1P5	9/4/12	0.782	U	0.782	397		5.21	0.521	U	0.521	421		130	73.5		6.52
N-OB-7	J1R0X5	8/30/12	0.259	U	0.259	537		1.73	0.173	U	0.173	347		43.2	87.6		2.16
N-OB-8	J1R0X6	8/30/12	0.243	U	0.243	529		1.62	0.162	U	0.162	328		40.5	87.2		2.03
N-OB-9	J1R0X7	8/30/12	0.278	U	0.278	567		1.86	0.186	U	0.186	315		46.4	92.2		2.32
N-OB-11	J1R0X9	8/30/12	0.284	U	0.284	850		1.89	0.189	U	0.189	283		47.3	69.3		2.37
N-OB-12	J1R100	8/30/12	0.279	U	0.279	835		1.86	0.186	U	0.186	299		46.5	64.1		2.33
S-OB-1	J1R102	8/30/12	0.285	U	0.285	629		1.90	0.190	U	0.190	391		47.5	67.1		2.37
Duplicate of J1R102	J1R114	8/30/12	0.285	U	0.285	747		1.90	0.190	U	0.190	336		47.4	69.4		2.37
S-OB-2	J1R103	8/30/12	0.290	U	0.290	688		1.93	0.193	U	0.193	350		48.4	67.3		2.42
S-OB-3	J1R104	8/30/12	0.300	U	0.300	557		2.00	0.200	U	0.200	392		50.0	65.3		2.50
S-OB-4	J1R105	8/30/12	0.281	U	0.281	801		1.87	0.187	U	0.187	454		46.8	75.4		2.34
S-OB-5	J1R106	8/30/12	0.290	U	0.290	575		1.93	0.193	U	0.193	399		48.3	73.2		2.42
S-OB-6	J1R107	8/30/12	0.295	U	0.295	608		1.97	0.197	U	0.197	403		49.2	67.7		2.46
S-OB-7	J1R108	8/30/12	0.301	U	0.301	705		2.01	0.201	U	0.201	337		50.1	64.9		2.51
S-OB-8	J1R109	8/30/12	0.270	U	0.270	552		1.80	0.180	U	0.180	436		44.9	69.1		2.25
S-OB-9	J1R110	8/30/12	0.295	U	0.295	730		1.97	0.197	U	0.197	339		49.2	73.1		2.46
S-OB-10	J1R111	8/30/12	0.301	U	0.301	680		2.01	0.201	U	0.201	395		50.2	74.3		2.51
S-OB-11	J1R112	8/30/12	0.284	U	0.284	588		1.89	0.189	U	0.189	389		47.3	66.6		2.37
S-OB-12	J1R113	8/30/12	0.284	U	0.284	757		1.89	0.189	U	0.189	297		47.3	63.2		2.36
FS-1	J1R0V4	9/4/12	0.874	U	0.874	321		5.83	0.583	U	0.583	534		146	68.6		7.28
Equipment Blank	J1R115	8/30/12	0.278	U	0.278	168		1.85	0.185	U	0.185	46.3	U	46.3	0.474	B	2.31

Attachment	1	Sheet No.	10 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Metals).

Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	41.1		22.8
Duplicate of J1R0V0	J1R0V5	8/30/12	38.7		26.5
EXC-1	J1R0T2	8/30/12	46.1		25.3
EXC-2	J1R0T3	8/30/12	45.8		26.0
EXC-3	J1R0T4	8/30/12	43.8		26.0
EXC-4	J1R0T5	8/30/12	45.3		25.9
EXC-5	J1R0T6	8/30/12	44.5		26.8
EXC-6	J1R0T7	8/30/12	44.3		25.5
EXC-7	J1R0T8	8/30/12	45.1		24.6
EXC-8	J1R0T9	8/30/12	44.8		25.5
EXC-10	J1R0V1	8/30/12	47.2		25.1
EXC-11	J1R0V2	8/30/12	46.4		24.2
EXC-12	J1R0V3	8/30/12	40.2		26.9
SPA-7	J1R0W2	8/29/12	44.5		21.7
Duplicate of J1R0W2	J1R0W8	8/29/12	47.5		25.7
SPA-1	J1R0V6	8/29/12	44.9		26.9
SPA-2	J1R0V7	8/29/12	43.1		28.5
SPA-3	J1R0V8	8/29/12	38.7		26.9
SPA-4	J1R0V9	8/29/12	52.9		29.2
SPA-5	J1R0W0	8/29/12	45.8		25.6
SPA-6	J1R0W1	8/29/12	41.0		26.0
SPA-8	J1R0W3	8/29/12	54.2		26.0
SPA-9	J1R0W4	8/29/12	42.9		25.7
SPA-10	J1R0W5	8/29/12	42.7		25.6
SPA-11	J1R0W6	8/29/12	41.6		24.9
SPA-12	J1R0W7	8/29/12	43.3		28.6
N-OB-10	J1R0X8	8/30/12	46.3		9.11
Duplicate of J1R0X8	J1R101	8/30/12	48.0		8.94
N-OB-1	J1R0W9	8/30/12	45.9		8.81
N-OB-2	J1R0X0	8/30/12	47.5		8.99
N-OB-3	J1R0X1	8/30/12	46.0		8.79
N-OB-4	J1R0X2	8/30/12	44.5		9.12
N-OB-5	J1R0X3	8/30/12	51.7		8.09
N-OB-6	J1R1P5	9/4/12	47.3		26.1
N-OB-7	J1R0X5	8/30/12	50.9		8.64
N-OB-8	J1R0X6	8/30/12	52.5		8.10
N-OB-9	J1R0X7	8/30/12	51.4		9.28
N-OB-11	J1R0X9	8/30/12	46.1		9.47
N-OB-12	J1R100	8/30/12	46.0		9.30
S-OB-1	J1R102	8/30/12	49.2		9.50
Duplicate of J1R102	J1R114	8/30/12	49.1		9.49
S-OB-2	J1R103	8/30/12	48.7		9.67
S-OB-3	J1R104	8/30/12	47.7		10.0
S-OB-4	J1R105	8/30/12	52.0		9.36
S-OB-5	J1R106	8/30/12	48.1		9.67
S-OB-6	J1R107	8/30/12	46.5		9.85
S-OB-7	J1R108	8/30/12	47.4		10.0
S-OB-8	J1R109	8/30/12	49.1		8.99
S-OB-9	J1R110	8/30/12	49.1		9.85
S-OB-10	J1R111	8/30/12	48.6		10.0
S-OB-11	J1R112	8/30/12	46.0		9.46
S-OB-12	J1R113	8/30/12	45.5		9.45
FS-1	J1R0V4	9/4/12	46.2		29.1
Equipment Blank	J1R115	8/30/12	3.49	B	9.26

Attachment	1	Sheet No.	11 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Anions and Physical).

Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1R0V0	8/30/12	0.9	U	0.9	1.0	B	0.9	0.9	U	0.9	8.7	J	0.9	0.9	UR	0.9
Duplicate of J1R0V0	J1R0V5	8/30/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	8.2	J	1.0	1.0	UR	1.0
EXC-1	J1R0T2	8/30/12	1.0	U	1.0	1.2	B	1.0	1.0	U	1.0	7.9	J	1.0	1.0	UR	1.0
EXC-2	J1R0T3	8/30/12	0.9	U	0.9	1.2	B	0.9	0.9	U	0.9	5.6	J	0.9	0.9	UR	0.9
EXC-3	J1R0T4	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	2.6	JB	1.0	1.0	UR	1.0
EXC-4	J1R0T5	8/30/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	7.1	J	1.0	1.0	UR	1.0
EXC-5	J1R0T6	8/30/12	1.0	U	1.0	1.0	B	1.0	1.0	U	1.0	4.6	JB	1.0	1.0	UR	1.0
EXC-6	J1R0T7	8/30/12	1.0	U	1.0	1.2	B	1.0	1.0	U	1.0	2.1	JB	1.0	1.0	UR	1.0
EXC-7	J1R0T8	8/30/12	1.0	U	1.0	1.5	B	1.0	1.0	U	1.0	6.2	J	1.0	1.0	UR	1.0
EXC-8	J1R0T9	8/30/12	1.0	U	1.0	1.0	B	1.0	1.0	U	1.0	2.7	JB	1.0	1.0	UR	1.0
EXC-10	J1R0V1	8/30/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	3.9	JB	1.0	1.0	UR	1.0
EXC-11	J1R0V2	8/30/12	1.0	U	1.0	1.7	B	1.0	1.0	U	1.0	5.7	J	1.0	1.0	UR	1.0
EXC-12	J1R0V3	8/30/12	1.0	U	1.0	2.2	B	1.0	1.0	U	1.0	14.1	J	1.0	1.0	UR	1.0
SPA-7	J1R0W2	8/29/12	1.0	U	1.0	12.1		1.0	1.0	U	1.0	182	D	4.9	1.0	U	1.0
Duplicate of J1R0W2	J1R0W8	8/29/12	1.0	U	1.0	13.4		1.0	1.0	U	1.0	191	D	4.9	1.0	U	1.0
SPA-1	J1R0V6	8/29/12	1.0	U	1.0	1.4	B	1.0	1.0	U	1.0	12.7		1.0	1.0	U	1.0
SPA-2	J1R0V7	8/29/12	1.0	U	1.0	1.8	B	1.0	1.0	U	1.0	26.5		1.0	1.0	U	1.0
SPA-3	J1R0V8	8/29/12	1.0	U	1.0	1.9	B	1.0	1.0	U	1.0	26.2		1.0	1.0	U	1.0
SPA-4	J1R0V9	8/29/12	1.0	U	1.0	4.3	B	1.0	1.0	U	1.0	54.8		1.0	1.0	U	1.0
SPA-5	J1R0W0	8/29/12	1.0	U	1.0	17.8		1.0	1.0	U	1.0	46.9		1.0	1.0	U	1.0
SPA-6	J1R0W1	8/29/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	9.2		1.0	1.0	U	1.0
SPA-8	J1R0W3	8/29/12	1.0	U	1.0	7.8		1.0	1.5	B	1.0	149	D	2.0	1.0	U	1.0
SPA-9	J1R0W4	8/29/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	11.8		1.0	1.0	U	1.0
SPA-10	J1R0W5	8/29/12	1.0	U	1.0	3.0	B	1.0	1.0	U	1.0	217	D	4.9	1.0	U	1.0
SPA-11	J1R0W6	8/29/12	1.0	U	1.0	1.3	B	1.0	1.0	U	1.0	22.5		1.0	1.0	U	1.0
SPA-12	J1R0W7	8/29/12	1.0	U	1.0	2.6	B	1.0	1.0	U	1.0	51.8		1.0	1.0	U	1.0
N-OB-10	J1R0X8	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	7.1		1.0	1.0	U	1.0
Duplicate of J1R0X8	J1R101	8/30/12	0.9	U	0.9	0.9	U	0.9	0.9	U	0.9	6.9		0.9	0.9	U	0.9
N-OB-1	J1R0W9	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	9.2		1.0	1.0	U	1.0
N-OB-2	J1R0X0	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.0	B	1.0	1.0	U	1.0
N-OB-3	J1R0X1	8/30/12	1.0	U	1.0	1.2	B	1.0	1.0	U	1.0	8.3		1.0	2.9	B	1.0
N-OB-4	J1R0X2	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.1	B	1.0	1.0	U	1.0
N-OB-5	J1R0X3	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	3.9	B	1.0	1.0	U	1.0
N-OB-6	J1R1P5	9/4/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.1	B	1.0	1.0	U	1.0
N-OB-7	J1R0X5	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.6	B	1.0	1.0	U	1.0
N-OB-8	J1R0X6	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.7	B	1.0	1.0	U	1.0
N-OB-9	J1R0X7	8/30/12	0.9	U	0.9	0.9	U	0.9	0.9	U	0.9	4.0	B	0.9	0.9	U	0.9
N-OB-11	J1R0X9	8/30/12	1.0	U	1.0	2.0	B	1.0	1.0	U	1.0	13.4		1.0	1.0	U	1.0
N-OB-12	J1R100	8/30/12	1.0	U	1.0	1.4	B	1.0	1.0	U	1.0	12.5		1.0	1.0	U	1.0
S-OB-1	J1R102	8/30/12	1.0	U	1.0	1.7	B	1.0	1.0	U	1.0	10.6		1.0	1.0	U	1.0
Duplicate of J1R102	J1R114	8/30/12	0.9	U	0.9	2.3	B	0.9	0.9	U	0.9	9.3		0.9	0.9	U	0.9
S-OB-2	J1R103	8/30/12	1.0	U	1.0	5.5		1.0	1.0	U	1.0	16.5		1.0	1.0	U	1.0
S-OB-3	J1R104	8/30/12	0.9	U	0.9	11.8		0.9	0.9	U	0.9	172	D	4.6	0.9	U	0.9
S-OB-4	J1R105	8/30/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	5.7		1.0	1.0	U	1.0
S-OB-5	J1R106	8/30/12	0.9	U	0.9	1.1	B	0.9	0.9	U	0.9	2.8	B	0.9	0.9	U	0.9
S-OB-6	J1R107	8/30/12	1.0	U	1.0	1.0	B	1.0	1.0	U	1.0	12.6		1.0	1.0	U	1.0
S-OB-7	J1R108	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	1.6	B	1.0	1.0	U	1.0
S-OB-8	J1R109	8/30/12	0.9	U	0.9	1.2	B	0.9	0.9	U	0.9	3.0	B	0.9	0.9	U	0.9
S-OB-9	J1R110	8/30/12	1.0	U	1.0	1.0	B	1.0	1.0	U	1.0	5.1		1.0	1.0	U	1.0
S-OB-10	J1R111	8/30/12	0.9	U	0.9	1.8	B	0.9	0.9	U	0.9	6.9		0.9	0.9	U	0.9
S-OB-11	J1R112	8/30/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	4.3	B	1.0	1.0	U	1.0
S-OB-12	J1R113	8/30/12	1.0	U	1.0	1.1	B	1.0	1.0	U	1.0	14.7		1.0	1.0	U	1.0
FS-1	J1R0V4	9/4/12	1.0	U	1.0	1.0	U	1.0	1.0	U	1.0	31.3	J	1.0	1.0	UR	1.0
Equipment Blank	J1R115	8/30/12															

Attachment	1	Sheet No.	12 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Anions and Physical).

Location	HEIS Number	Sample Date	Nitrogen in Nitrite and Nitrate			Orthophosphate			Sulfate			Percent Solids			pH Measurement		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	%	Q	PQL	pH	Q	PQL
EXC-9	J1R0V0	8/30/12	1.68		0.09	2.8	JB	1.9	9.1		0.9	99.7		0.1	9.09	J	0.10
Duplicate of J1R0V0	J1R0V5	8/30/12	1.90		0.10	3.2	JB	2.0	9.4		1.0	99.2		0.1	9.07	J	0.10
EXC-1	J1R0T2	8/30/12	1.79		0.10	3.8	JB	2.0	10.2		1.0	98.9		0.1	9.28	J	0.10
EXC-2	J1R0T3	8/30/12	1.39		0.09	3.5	JB	1.8	12.0		0.9	99.5		0.1	9.17	J	0.10
EXC-3	J1R0T4	8/30/12	0.65		0.10	2.0	UR	2.0	5.7		1.0	99.6		0.1	9.15	J	0.10
EXC-4	J1R0T5	8/30/12	1.69		0.10	3.6	JB	2.0	8.4		1.0	99.7		0.1	9.00	J	0.10
EXC-5	J1R0T6	8/30/12	1.19		0.10	4.4	JB	2.0	6.1		1.0	99.9		0.1	9.12	J	0.10
EXC-6	J1R0T7	8/30/12	0.55		0.10	4.8	JB	2.0	6.2		1.0	99.6		0.1	8.88	J	0.10
EXC-7	J1R0T8	8/30/12	1.40		0.10	4.0	JB	2.0	14.7		1.0	99.8		0.1	9.01	J	0.10
EXC-8	J1R0T9	8/30/12	0.68		0.10	2.8	JB	2.0	13.7		1.0	99.6		0.1	9.10	J	0.10
EXC-10	J1R0V1	8/30/12	0.88		0.10	3.9	JB	2.0	7.1		1.0	99.7		0.1	8.94	J	0.10
EXC-11	J1R0V2	8/30/12	1.30		0.10	2.7	JB	2.0	12.1		1.0	99.9		0.1	9.01	J	0.10
EXC-12	J1R0V3	8/30/12	3.14		0.10	2.0	U	2.0	16.8		1.0	99.5		0.1	9.12	J	0.10
SPA-7	J1R0W2	8/29/12	40.4	D	0.97	2.8	B	1.9	86.9		1.0	98.9		0.1	8.61		0.10
Duplicate of J1R0W2	J1R0W8	8/29/12	43.6	D	0.99	2.7	B	2.0	98.5		1.0	99.0		0.1	8.61		0.10
SPA-1	J1R0V6	8/29/12	3.03		0.10	2.2	B	2.0	9.4		1.0	99.4		0.1	8.81		0.10
SPA-2	J1R0V7	8/29/12	6.04		0.10	3.8	B	2.0	13.1		1.0	99.3		0.1	8.86		0.10
SPA-3	J1R0V8	8/29/12	6.11		0.10	3.6	B	1.9	12.8		1.0	99.6		0.1	8.90		0.10
SPA-4	J1R0V9	8/29/12	12.5	D	0.20	4.5	B	2.0	18.0		1.0	98.7		0.1	8.83		0.10
SPA-5	J1R0W0	8/29/12	10.7	D	0.20	2.6	B	2.0	21.1		1.0	99.4		0.1	8.56		0.10
SPA-6	J1R0W1	8/29/12	2.40		0.10	6.9	B	2.0	6.5		1.0	99.4		0.1	8.84		0.10
SPA-8	J1R0W3	8/29/12	31.5	D	0.50	3.2	B	2.0	93.2		1.0	99.3		0.1	8.22		0.10
SPA-9	J1R0W4	8/29/12	2.85		0.10	3.0	B	2.0	15.4		1.0	98.9		0.1	8.99		0.10
SPA-10	J1R0W5	8/29/12	47.7	D	0.97	2.1	B	1.9	32.5		1.0	99.4		0.1	8.08		0.10
SPA-11	J1R0W6	8/29/12	5.01		0.10	1.9	U	1.9	7.4		1.0	98.9		0.1	8.78		0.10
SPA-12	J1R0W7	8/29/12	12.0	D	0.49	2.5	B	2.0	12.1		1.0	98.8		0.1	8.77		0.10
N-OB-10	J1R0X8	8/30/12	1.83		0.10	2.3	B	1.9	3.9	B	1.0	99.8		0.1	8.81		0.10
Duplicate of J1R0X8	J1R101	8/30/12	1.80		0.09	2.8	B	1.9	5.7		0.9	99.9		0.1	8.70		0.10
N-OB-1	J1R0W9	8/30/12	2.36		0.10	2.2	B	2.0	6.1		1.0	99.6		0.1	8.54		0.10
N-OB-2	J1R0X0	8/30/12	0.73		0.10	2.0	U	2.0	3.4	B	1.0	99.3		0.1	8.80		0.10
N-OB-3	J1R0X1	8/30/12	2.24		0.10	3.4	B	1.9	5.8		1.0	99.8		0.1	8.68		0.10
N-OB-4	J1R0X2	8/30/12	0.74		0.10	2.0	U	2.0	4.0	B	1.0	99.7		0.1	8.77		0.10
N-OB-5	J1R0X3	8/30/12	1.07		0.10	2.0	U	2.0	4.7	B	1.0	99.7		0.1	8.78		0.10
N-OB-6	J1R1P5	9/4/12	0.96		0.10	2.0	U	2.0	3.2	B	1.0	99.2		0.1	8.49		0.10
N-OB-7	J1R0X5	8/30/12	1.06		0.10	2.5	B	1.9	2.6	B	1.0	99.8		0.1	8.82		0.10
N-OB-8	J1R0X6	8/30/12	0.43	B	0.10	2.0	U	2.0	3.2	B	1.0	99.6		0.1	8.84		0.10
N-OB-9	J1R0X7	8/30/12	1.10		0.09	2.6	B	1.9	2.6	B	0.9	99.8		0.1	8.72		0.10
N-OB-11	J1R0X9	8/30/12	3.19		0.10	5.2	B	2.0	3.5	B	1.0	99.7		0.1	8.70		0.10
N-OB-12	J1R100	8/30/12	3.06		0.10	5.2	B	2.0	4.1	B	1.0	99.6		0.1	8.65		0.10
S-OB-1	J1R102	8/30/12	2.68		0.10	1.9	B	1.9	10.1		1.0	99.3		0.1	8.45		0.10
Duplicate of J1R102	J1R114	8/30/12	2.03		0.09	3.4	B	1.8	7.8		0.9	99.4		0.1	8.48		0.10
S-OB-2	J1R103	8/30/12	3.92		0.10	3.8	B	2.0	9.6		1.0	99.4		0.1	8.44		0.10
S-OB-3	J1R104	8/30/12	40.4	D	0.92	1.8	U	1.8	69.6		0.9	98.1		0.1	8.21		0.10
S-OB-4	J1R105	8/30/12	1.44		0.10	2.5	B	1.9	7.6		1.0	98.9		0.1	8.47		0.10
S-OB-5	J1R106	8/30/12	0.77		0.09	1.8	U	1.8	6.6		0.9	99.5		0.1	8.77		0.10
S-OB-6	J1R107	8/30/12	3.00		0.10	3.0	B	2.0	7.2		1.0	99.5		0.1	8.60		0.10
S-OB-7	J1R108	8/30/12	0.46	B	0.10	2.3	B	2.0	4.5	B	1.0	99.7		0.1	8.52		0.10
S-OB-8	J1R109	8/30/12	0.71		0.09	1.9	U	1.9	7.1		0.9	99.3		0.1	8.56		0.10
S-OB-9	J1R110	8/30/12	1.17		0.10	2.9	B	1.9	5.4		1.0	99.5		0.1	8.61		0.10
S-OB-10	J1R111	8/30/12	1.58		0.09	2.3	B	1.8	7.8		0.9	99.5		0.1	8.73		0.10
S-OB-11	J1R112	8/30/12	1.04		0.10	2.4	B	2.0	3.4	B	1.0	99.7		0.1	8.50		0.10
S-OB-12	J1R113	8/30/12	3.29		0.10	3.9	B	1.9	4.7	B	1.0	99.8		0.1	8.42		0.10
FS-1	J1R0V4	9/4/12	7.46		0.10	2.1	B	2.0	9.5		1.0	95.3		0.1	8.76	J	0.10
Equipment Blank	J1R115	8/30/12										100		0.1			

Attachment	1	Sheet No.	13 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-9 - J1R0V0			Duplicate of J1R0V0 - J1R0V5			EXC-1 - J1R0T2			EXC-2 - J1R0T3			EXC-3 - J1R0T4		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1221	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1232	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1242	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1248	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1254	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1260	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1262	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aroclor-1268	PCB	13.3	U	13.3	13.2	U	13.2	13.4	U	13.4	13.0	U	13.0	13.3	U	13.3
Aldrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Alpha-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
alpha-Chlordane	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Beta-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Delta-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
4-4'-DDD	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
4-4'-DDE	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
4-4'-DDT	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Dieldrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endosulfan I	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endosulfan II	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endosulfan sulfate	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endrin aldehyde	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Endrin ketone	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
gamma-Chlordane	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Heptachlor	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Heptachlor epoxide	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Methoxychlor	PEST	1.32	UD	1.32	1.31	UD	1.31	1.33	UD	1.33	1.29	UD	1.29	1.32	UD	1.32
Toxaphene	PEST	13.2	UJD	13.2	13.1	UJD	13.1	13.3	UJD	13.3	12.9	UJD	12.9	13.2	UJD	13.2
1,2,4-Trichlorobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
1,2-Dichlorobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
1,3-Dichlorobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
1,4-Dichlorobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,4,5-Trichlorophenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,4,6-Trichlorophenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,4-Dichlorophenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,4-Dimethylphenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,4-Dinitrophenol	SVOA	1650	UJ	1650	1660	UJ	1660	1660	UJ	1660	1650	UJ	1650	1650	UJ	1650
2,4-Dinitrotoluene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2,6-Dinitrotoluene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2-Chloronaphthalene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2-Chlorophenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2-Methylnaphthalene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2-Methylphenol (cresol, o-)	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
2-Nitroaniline	SVOA	1650	U	1650	1660	U	1660	1660	U	1660	1650	U	1650	1650	U	1650
2-Nitrophenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330

Attachment	1	Sheet No.	14 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-9 - J1R0V0			Duplicate of J1R0V0 - J1R0V5			EXC-1 - J1R0T2			EXC-2 - J1R0T3			EXC-3 - J1R0T4		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
3,3'-Dichlorobenzidine	SVOA	658	U	658	665	U	665	666	U	666	662	U	662	660	U	660
3-Nitroaniline	SVOA	1650	U	1650	1660	U	1660	1660	U	1660	1650	U	1650	1650	U	1650
4,6-Dinitro-2-methylphenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
4-Bromophenylphenyl ether	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
4-Chloro-3-methylphenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
4-Chloroaniline	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
4-Chlorophenylphenyl ether	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
4-Nitroaniline	SVOA	1650	U	1650	1660	U	1660	1660	U	1660	1650	U	1650	1650	U	1650
4-Nitrophenol	SVOA	1650	U	1650	1660	U	1660	1660	U	1660	1650	U	1650	1650	U	1650
Acenaphthene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Acenaphthylene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Anthracene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Benzo(a)anthracene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Benzo(a)pyrene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Benzo(b)fluoranthene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Benzo(ghi)perylene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Benzo(k)fluoranthene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Bis(2-chloro-1-methylethyl)ether	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Bis(2-Chloroethoxy)methane	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Bis(2-chloroethyl) ether	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Bis(2-ethylhexyl) phthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Butylbenzylphthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Carbazole	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Chrysene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Di-n-butylphthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Di-n-octylphthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Dibenz[a,h]anthracene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Dibenzofuran	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Diethyl phthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Dimethyl phthalate	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Fluoranthene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Fluorene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Hexachlorobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Hexachlorobutadiene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Hexachlorocyclopentadiene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Hexachloroethane	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Indeno(1,2,3-cd)pyrene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Isophorone	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
N-Nitroso-di-n-dipropylamine	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
N-Nitrosodiphenylamine	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Naphthalene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Nitrobenzene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Pentachlorophenol	SVOA	1650	U	1650	1660	U	1660	1660	U	1660	1650	U	1650	1650	U	1650
Phenanthrene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Phenol	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330
Pyrene	SVOA	329	U	329	332	U	332	333	U	333	331	U	331	330	U	330

Attachment	1	Sheet No.	15 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-4 - J1R0T5			EXC-5 - J1R0T6			EXC-6 - J1R0T7			EXC-7 - J1R0T8			EXC-8 - J1R0T9		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1221	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1232	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1242	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1248	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1254	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1260	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1262	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aroclor-1268	PCB	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.3	U	13.3	13.1	U	13.1
Aldrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Alpha-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
alpha-Chlordane	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Beta-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Delta-BHC	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
4-4'-DDD	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
4-4'-DDE	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
4-4'-DDT	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Dieldrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endosulfan I	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endosulfan II	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endosulfan sulfate	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endrin	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endrin aldehyde	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Endrin ketone	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
gamma-Chlordane	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Heptachlor	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Heptachlor epoxide	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Methoxychlor	PEST	1.32	UD	1.32	1.31	UD	1.31	1.32	UD	1.32	1.32	UD	1.32	1.30	UD	1.30
Toxaphene	PEST	13.2	UJD	13.2	13.1	UJD	13.1	13.2	UJD	13.2	13.2	UJD	13.2	13.0	UJD	13.0
1,2,4-Trichlorobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
1,2-Dichlorobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
1,3-Dichlorobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
1,4-Dichlorobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,4,5-Trichlorophenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,4,6-Trichlorophenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,4-Dichlorophenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,4-Dimethylphenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,4-Dinitrophenol	SVOA	1650	UJ	1650	1640	UJ	1640	1610	UJ	1610	1600	UJ	1600	1640	UJ	1640
2,4-Dinitrotoluene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2,6-Dinitrotoluene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2-Chloronaphthalene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2-Chlorophenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2-Methylnaphthalene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2-Methylphenol (cresol, o-)	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
2-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1610	U	1610	1600	U	1600	1640	U	1640
2-Nitrophenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329

Attachment	1	Sheet No.	16 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-4 - J1R0T5			EXC-5 - J1R0T6			EXC-6 - J1R0T7			EXC-7 - J1R0T8			EXC-8 - J1R0T9		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
3,3'-Dichlorobenzidine	SVOA	661	U	661	657	U	657	644	U	644	640	U	640	658	U	658
3-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1610	U	1610	1600	U	1600	1640	U	1640
4,6-Dinitro-2-methylphenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
4-Bromophenylphenyl ether	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
4-Chloro-3-methylphenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
4-Chloroaniline	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
4-Chlorophenylphenyl ether	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
4-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1610	U	1610	1600	U	1600	1640	U	1640
4-Nitrophenol	SVOA	1650	U	1650	1640	U	1640	1610	U	1610	1600	U	1600	1640	U	1640
Acenaphthene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Acenaphthylene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Anthracene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Benzo(a)anthracene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Benzo(a)pyrene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Benzo(b)fluoranthene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Benzo(ghi)perylene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Benzo(k)fluoranthene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Bis(2-chloro-1-methylethyl)ether	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Bis(2-Chloroethoxy)methane	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Bis(2-chloroethyl) ether	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Bis(2-ethylhexyl) phthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Butylbenzylphthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Carbazole	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Chrysene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Di-n-butylphthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Di-n-octylphthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Dibenz[a,h]anthracene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Dibenzofuran	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Diethyl phthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Dimethyl phthalate	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Fluoranthene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Fluorene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Hexachlorobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Hexachlorobutadiene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Hexachlorocyclopentadiene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Hexachloroethane	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Indeno(1,2,3-cd)pyrene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Isophorone	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
N-Nitroso-di-n-dipropylamine	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
N-Nitrosodiphenylamine	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Naphthalene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Nitrobenzene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Pentachlorophenol	SVOA	1650	U	1650	1640	U	1640	1610	U	1610	1600	U	1600	1640	U	1640
Phenanthrene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Phenol	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329
Pyrene	SVOA	331	U	331	329	U	329	322	U	322	320	U	320	329	U	329

Attachment	1	Sheet No.	17 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-10 - J1R0V1			EXC-11 - J1R0V2			EXC-12 - J1R0V3			SPA-7 - J1R0W2			Duplicate of J1R0W2 - J1R0W8		
		8/30/12			8/30/12			8/30/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1221	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1232	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1242	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1248	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1254	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1260	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1262	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aroclor-1268	PCB	13.1	U	13.1	13.2	U	13.2	13.1	U	13.1	13.2	U	13.2	13.3	U	13.3
Aldrin	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Alpha-BHC	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
alpha-Chlordane	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Beta-BHC	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Delta-BHC	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDD	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDE	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDT	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Dieldrin	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endosulfan I	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endosulfan II	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endosulfan sulfate	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endrin	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endrin aldehyde	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Endrin ketone	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Gamma-BHC (Lindane)	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
gamma-Chlordane	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Heptachlor	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Heptachlor epoxide	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Methoxychlor	PEST	1.30	UD	1.30	1.31	UD	1.31	1.30	UD	1.30	1.31	UD	1.31	1.32	UD	1.32
Toxaphene	PEST	13.0	UJD	13.0	13.1	UJD	13.1	13.0	UJD	13.0	13.1	UD	13.1	13.2	UD	13.2
1,2,4-Trichlorobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
1,2-Dichlorobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
1,3-Dichlorobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
1,4-Dichlorobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,4,5-Trichlorophenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,4,6-Trichlorophenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,4-Dichlorophenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,4-Dimethylphenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,4-Dinitrophenol	SVOA	1640	UJ	1640	1650	UJ	1650	1630	UJ	1630	1660	U	1660	1650	U	1650
2,4-Dinitrotoluene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2,6-Dinitrotoluene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2-Chloronaphthalene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2-Chlorophenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2-Methylnaphthalene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2-Methylphenol (cresol, o-)	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
2-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1630	U	1630	1660	U	1660	1650	U	1650
2-Nitrophenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330

Attachment	1	Sheet No.	18 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	EXC-10 - J1R0V1			EXC-11 - J1R0V2			EXC-12 - J1R0V3			SPA-7 - J1R0W2			Duplicate of J1R0W2 - J1R0W8		
		8/30/12			8/30/12			8/30/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
3,3'-Dichlorobenzidine	SVOA	657	U	657	660	U	660	650	U	650	666	U	666	660	U	660
3-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1630	U	1630	1660	U	1660	1650	U	1650
4,6-Dinitro-2-methylphenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
4-Bromophenylphenyl ether	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
4-Chloro-3-methylphenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
4-Chloroaniline	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
4-Chlorophenylphenyl ether	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
4-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1630	U	1630	1660	U	1660	1650	U	1650
4-Nitrophenol	SVOA	1640	U	1640	1650	U	1650	1630	U	1630	1660	U	1660	1650	U	1650
Acenaphthene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Acenaphthylene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Anthracene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Benzo(a)anthracene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Benzo(a)pyrene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Benzo(b)fluoranthene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Benzo(ghi)perylene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Benzo(k)fluoranthene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Bis(2-chloro-1-methylethyl)ether	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Bis(2-Chloroethoxy)methane	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Bis(2-chloroethyl) ether	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Bis(2-ethylhexyl) phthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Butylbenzylphthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Carbazole	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Chrysene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Di-n-butylphthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Di-n-octylphthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Dibenz[a,h]anthracene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Dibenzofuran	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Diethyl phthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Dimethyl phthalate	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Fluoranthene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Fluorene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Hexachlorobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Hexachlorobutadiene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Hexachlorocyclopentadiene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Hexachloroethane	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Indeno(1,2,3-cd)pyrene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Isophorone	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
N-Nitroso-di-n-dipropylamine	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
N-Nitrosodiphenylamine	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Naphthalene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Nitrobenzene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Pentachlorophenol	SVOA	1640	U	1640	1650	U	1650	1630	U	1630	1660	U	1660	1650	U	1650
Phenanthrene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Phenol	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330
Pyrene	SVOA	328	U	328	330	U	330	325	U	325	333	U	333	330	U	330

Attachment	1	Sheet No.	19 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-1 - J1R0V6			SPA-2 - J1R0V7			SPA-3 - J1R0V8			SPA-4 - J1R0V9			SPA-5 - J1R0W0		
		8/29/12			8/29/12			8/29/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1221	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1232	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1242	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1248	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1254	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1260	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1262	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aroclor-1268	PCB	13.2	U	13.2	13.2	U	13.2	13	U	13	13.3	U	13.3	13.3	U	13.3
Aldrin	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Alpha-BHC	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
alpha-Chlordane	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Beta-BHC	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Delta-BHC	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDD	PEST.	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDE	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDT	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Dieldrin	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endosulfan I	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endosulfan II	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endosulfan sulfate	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endrin	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endrin aldehyde	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Endrin ketone	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Gamma-BHC (Lindane)	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
gamma-Chlordane	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Heptachlor	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Heptachlor epoxide	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Methoxychlor	PEST	1.31	UD	1.31	1.31	UD	1.31	1.29	UD	1.29	1.32	UD	1.32	1.32	UD	1.32
Toxaphene	PEST	13.1	UD	13.1	13.1	UD	13.1	12.9	UD	12.9	13.2	UD	13.2	13.2	UD	13.2
1,2,4-Trichlorobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
1,2-Dichlorobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
1,3-Dichlorobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
1,4-Dichlorobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,4,5-Trichlorophenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,4,6-Trichlorophenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,4-Dichlorophenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,4-Dimethylphenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,4-Dinitrophenol	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
2,4-Dinitrotoluene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2,6-Dinitrotoluene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2-Chloronaphthalene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2-Chlorophenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2-Methylnaphthalene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2-Methylphenol (cresol, o-)	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
2-Nitroaniline	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
2-Nitrophenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331

Attachment	1	Sheet No.	20 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-1 - J1R0V6			SPA-2 - J1R0V7			SPA-3 - J1R0V8			SPA-4 - J1R0V9			SPA-5 - J1R0W0		
		8/29/12			8/29/12			8/29/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
3,3'-Dichlorobenzidine	SVOA	1980	UD	1980	661	U	661	645	U	645	664	U	664	661	U	661
3-Nitroaniline	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
4,6-Dinitro-2-methylphenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
4-Bromophenylphenyl ether	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
4-Chloro-3-methylphenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
4-Chloroaniline	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
4-Chlorophenylphenyl ether	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
4-Nitroaniline	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
4-Nitrophenol	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
Acenaphthene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Acenaphthylene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Anthracene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Benzo(a)anthracene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Benzo(a)pyrene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Benzo(b)fluoranthene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Benzo(ghi)perylene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Benzo(k)fluoranthene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Bis(2-chloro-1-methylethyl)ether	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Bis(2-Chloroethoxy)methane	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Bis(2-chloroethyl) ether	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Bis(2-ethylhexyl) phthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Butylbenzylphthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Carbazole	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Chrysene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Di-n-butylphthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Di-n-octylphthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Dibenz[a,h]anthracene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Dibenzofuran	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Diethyl phthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Dimethyl phthalate	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Fluoranthene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Fluorene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Hexachlorobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Hexachlorobutadiene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Hexachlorocyclopentadiene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Hexachloroethane	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Indeno(1,2,3-cd)pyrene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Isophorone	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
N-Nitroso-di-n-dipropylamine	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
N-Nitrosodiphenylamine	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Naphthalene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Nitrobenzene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Pentachlorophenol	SVOA	4950	UD	4950	1650	U	1650	1610	U	1610	1660	U	1660	1650	U	1650
Phenanthrene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Phenol	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331
Pyrene	SVOA	991	UD	991	330	U	330	322	U	322	332	U	332	331	U	331

Attachment	1	Sheet No.	21 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-6 - J1R0W1			SPA-8 - J1R0W3			SPA-9 - J1R0W4			SPA-10 - J1R0W5			SPA-11 - J1R0W6		
		8/29/12			8/29/12			8/29/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1221	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1232	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1242	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1248	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1254	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1260	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1262	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aroclor-1268	PCB	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4	13.2	U	13.2	13.3	U	13.3
Aldrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Alpha-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
alpha-Chlordane	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Beta-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Delta-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDD	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDE	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
4-4'-DDT	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Dieldrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endosulfan I	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endosulfan II	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endosulfan sulfate	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endrin aldehyde	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Endrin ketone	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
gamma-Chlordane	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Heptachlor	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Heptachlor epoxide	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Methoxychlor	PEST	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33	1.31	UD	1.31	1.32	UD	1.32
Toxaphene	PEST	13.2	UD	13.2	13.2	UD	13.2	13.3	UD	13.3	13.1	UD	13.1	13.2	UD	13.2
1,2,4-Trichlorobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
1,2-Dichlorobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
1,3-Dichlorobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
1,4-Dichlorobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,4,5-Trichlorophenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,4,6-Trichlorophenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,4-Dichlorophenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,4-Dimethylphenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,4-Dinitrophenol	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
2,4-Dinitrotoluene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2,6-Dinitrotoluene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2-Chloronaphthalene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2-Chlorophenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2-Methylnaphthalene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2-Methylphenol (cresol, o-)	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
2-Nitroaniline	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
2-Nitrophenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333

Attachment	1	Sheet No.	22 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-6 - J1R0W1			SPA-8 - J1R0W3			SPA-9 - J1R0W4			SPA-10 - J1R0W5			SPA-11 - J1R0W6		
		8/29/12			8/29/12			8/29/12			8/29/12			8/29/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
3,3'-Dichlorobenzidine	SVOA	659	U	659	660	U	660	664	U	664	659	U	659	666	U	666
3-Nitroaniline	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
4-Bromophenylphenyl ether	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
4-Chloro-3-methylphenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
4-Chloroaniline	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
4-Chlorophenylphenyl ether	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
4-Nitroaniline	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
4-Nitrophenol	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
Acenaphthene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Acenaphthylene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Anthracene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Benzo(a)anthracene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Benzo(a)pyrene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Benzo(b)fluoranthene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Benzo(ghi)perylene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Benzo(k)fluoranthene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Bis(2-chloro-1-methylethyl)ether	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Bis(2-Chloroethoxy)methane	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Bis(2-chloroethyl) ether	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Bis(2-ethylhexyl) phthalate	SVOA	147	J	330	330	U	330	332	U	332	330	U	330	333	U	333
Butylbenzylphthalate	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Carbazole	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Chrysene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Di-n-butylphthalate	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Di-n-octylphthalate	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Dibenz[a,h]anthracene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Dibenzofuran	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Diethyl phthalate	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Dimethyl phthalate	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Fluoranthene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Fluorene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Hexachlorobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Hexachlorobutadiene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Hexachlorocyclopentadiene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Hexachloroethane	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Indeno(1,2,3-cd)pyrene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Isophorone	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
N-Nitroso-di-n-dipropylamine	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
N-Nitrosodiphenylamine	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Naphthalene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Nitrobenzene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Pentachlorophenol	SVOA	1650	U	1650	1650	U	1650	1660	U	1660	1650	U	1650	1670	U	1670
Phenanthrene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Phenol	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333
Pyrene	SVOA	330	U	330	330	U	330	332	U	332	330	U	330	333	U	333

Attachment	1	Sheet No.	23 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-12 - J1R0W7			N-OB-10 - J1R0X8			Duplicate of J1R0X8 - J1R101			N-OB-1 - J1R0W9			N-OB-2 - J1R0X0		
		8/29/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1221	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1232	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1242	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1248	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1254	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1260	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1262	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aroclor-1268	PCB	12.8	U	12.8	13.2	U	13.2	13.3	U	13.3	12.7	U	12.7	13.4	U	13.4
Aldrin	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Alpha-BHC	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
alpha-Chlordane	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Beta-BHC	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Delta-BHC	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
4-4'-DDD	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
4-4'-DDE	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
4-4'-DDT	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Dieldrin	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endosulfan I	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endosulfan II	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endosulfan sulfate	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endrin	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endrin aldehyde	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Endrin ketone	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Gamma-BHC (Lindane)	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
gamma-Chlordane	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Heptachlor	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Heptachlor epoxide	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Methoxychlor	PEST	1.27	UD	1.27	1.31	UD	1.31	1.32	UD	1.32	1.26	UD	1.26	1.33	UD	1.33
Toxaphene	PEST	12.7	UD	12.7	13.1	UD	13.1	13.2	UD	13.2	12.6	UD	12.6	13.3	UD	13.3
1,2,4-Trichlorobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
1,2-Dichlorobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
1,3-Dichlorobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
1,4-Dichlorobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,4,5-Trichlorophenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,4,6-Trichlorophenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,4-Dichlorophenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,4-Dimethylphenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,4-Dinitrophenol	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
2,4-Dinitrotoluene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2,6-Dinitrotoluene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2-Chloronaphthalene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2-Chlorophenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2-Methylnaphthalene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2-Methylphenol (cresol, o-)	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
2-Nitroaniline	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
2-Nitrophenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326

Attachment	1	Sheet No.	24 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	SPA-12 - J1R0W7			N-OB-10 - J1R0X8			Duplicate of J1R0X8 - J1R101			N-OB-1 - J1R0W9			N-OB-2 - J1R0X0		
		8/29/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
3,3'-Dichlorobenzidine	SVOA	664	U	664	657	U	657	655	U	655	650	U	650	652	U	652
3-Nitroaniline	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
4,6-Dinitro-2-methylphenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
4-Bromophenylphenyl ether	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
4-Chloro-3-methylphenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
4-Chloroaniline	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
4-Chlorophenylphenyl ether	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
4-Nitroaniline	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
4-Nitrophenol	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
Acenaphthene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Acenaphthylene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Anthracene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Benzo(a)anthracene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Benzo(a)pyrene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Benzo(b)fluoranthene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Benzo(ghi)perylene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Benzo(k)fluoranthene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Bis(2-chloro-1-methylethyl)ether	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Bis(2-Chloroethoxy)methane	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Bis(2-chloroethyl) ether	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Bis(2-ethylhexyl) phthalate	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Butylbenzylphthalate	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Carbazole	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Chrysene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Di-n-butylphthalate	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Di-n-octylphthalate	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Dibenz[a,h]anthracene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Dibenzofuran	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Diethyl phthalate	SVOA	332	U	332	328	U	328	327	U	327	64.7	J	325	326	U	326
Dimethyl phthalate	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Fluoranthene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Fluorene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Hexachlorobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Hexachlorobutadiene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Hexachlorocyclopentadiene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Hexachloroethane	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Indeno(1,2,3-cd)pyrene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Isophorone	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
N-Nitroso-di-n-dipropylamine	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
N-Nitrosodiphenylamine	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Naphthalene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Nitrobenzene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Pentachlorophenol	SVOA	1660	U	1660	1640	U	1640	1640	U	1640	1620	U	1620	1630	U	1630
Phenanthrene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Phenol	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326
Pyrene	SVOA	332	U	332	328	U	328	327	U	327	325	U	325	326	U	326

Attachment	1	Sheet No.	25 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	N-OB-3 - J1R0X1			N-OB-4 - J1R0X2			N-OB-5 - J1R0X3			N-OB-6 - J1R1P5			N-OB-7 - J1R0X5		
		8/30/12			8/30/12			8/30/12			9/4/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1221	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1232	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1242	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1248	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1254	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1260	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1262	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aroclor-1268	PCB	13.3	U	13.3	13.3	U	13.3	13.2	U	13.2	13.3	U	13.3	13.1	U	13.1
Aldrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Alpha-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
alpha-Chlordane	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Beta-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Delta-BHC	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
4-4'-DDD	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
4-4'-DDE	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
4-4'-DDT	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Dieldrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endosulfan I	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endosulfan II	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endosulfan sulfate	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endrin	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endrin aldehyde	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Endrin ketone	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
gamma-Chlordane	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Heptachlor	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Heptachlor epoxide	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Methoxychlor	PEST	1.32	UD	1.32	1.32	UD	1.32	1.31	UD	1.31	1.32	U	1.32	1.30	UD	1.30
Toxaphene	PEST	13.2	UD	13.2	13.2	UD	13.2	13.1	UD	13.1	13.2	U	13.2	13.0	UD	13.0
1,2,4-Trichlorobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
1,2-Dichlorobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
1,3-Dichlorobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
1,4-Dichlorobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,4,5-Trichlorophenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,4,6-Trichlorophenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,4-Dichlorophenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,4-Dimethylphenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,4-Dinitrophenol	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	1620	U	1620	1640	U	1640
2,4-Dinitrotoluene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2,6-Dinitrotoluene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2-Chloronaphthalene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2-Chlorophenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2-Methylnaphthalene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2-Methylphenol (cresol, o-)	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
2-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	1620	U	1620	1640	U	1640
2-Nitrophenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327

Attachment	1	Sheet No.	26 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	N-OB-3 - J1R0X1			N-OB-4 - J1R0X2			N-OB-5 - J1R0X3			N-OB-6 - J1R1P5			N-OB-7 - J1R0X5		
		8/30/12			8/30/12			8/30/12			9/4/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
3,3'-Dichlorobenzidine	SVOA	659	U	659	655	U	655	651	U	651	648	U	648	654	U	654
3-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	1620	U	1620	1640	U	1640
4,6-Dinitro-2-methylphenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
4-Bromophenylphenyl ether	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
4-Chloro-3-methylphenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
4-Chloroaniline	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
4-Chlorophenylphenyl ether	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
4-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	324	U	324	1640	U	1640
4-Nitrophenol	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	1620	U	1620	1640	U	1640
Acenaphthene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Acenaphthylene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Anthracene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Benzo(a)anthracene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Benzo(a)pyrene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Benzo(b)fluoranthene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Benzo(ghi)perylene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Benzo(k)fluoranthene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Bis(2-chloro-1-methylethyl)ether	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Bis(2-Chloroethoxy)methane	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Bis(2-chloroethyl) ether	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Bis(2-ethylhexyl) phthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Butylbenzylphthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Carbazole	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Chrysene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Di-n-butylphthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Di-n-octylphthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Dibenz[a,h]anthracene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Dibenzofuran	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Diethyl phthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Dimethyl phthalate	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Fluoranthene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Fluorene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Hexachlorobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Hexachlorobutadiene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Hexachlorocyclopentadiene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Hexachloroethane	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Indeno(1,2,3-cd)pyrene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Isophorone	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
N-Nitroso-di-n-dipropylamine	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
N-Nitrosodiphenylamine	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Naphthalene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Nitrobenzene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Pentachlorophenol	SVOA	1650	U	1650	1640	U	1640	1630	U	1630	1620	U	1620	1640	U	1640
Phenanthrene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Phenol	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327
Pyrene	SVOA	329	U	329	328	U	328	326	U	326	324	U	324	327	U	327

Attachment	1	Sheet No.	27 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	N-OB-8 - J1R0X6			N-OB-9 - J1R0X7			N-OB-11 - J1R0X9			N-OB-12 - J1R100			S-OB-1 - J1R102		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1221	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1232	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1242	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1248	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1254	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1260	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1262	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aroclor-1268	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.3	U	13.3	13.4	U	13.4
Aldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Alpha-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
alpha-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Beta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Delta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
4-4'-DDD	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
4-4'-DDE	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
4-4'-DDT	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Dieldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endosulfan I	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endosulfan II	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endosulfan sulfate	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endrin aldehyde	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Endrin ketone	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
gamma-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Heptachlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Heptachlor epoxide	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Methoxychlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.32	UD	1.32	1.33	UD	1.33
Toxaphene	PEST	13.2	UD	13.2	13.0	UD	13.0	13.2	UD	13.2	13.2	UD	13.2	13.3	UD	13.3
1,2,4-Trichlorobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
1,2-Dichlorobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
1,3-Dichlorobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
1,4-Dichlorobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,4,5-Trichlorophenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,4,6-Trichlorophenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,4-Dichlorophenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,4-Dimethylphenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,4-Dinitrophenol	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
2,4-Dinitrotoluene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2,6-Dinitrotoluene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2-Chloronaphthalene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2-Chlorophenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2-Methylnaphthalene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2-Methylphenol (cresol, o-)	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
2-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
2-Nitrophenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328

Attachment	1	Sheet No.	28 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	N-OB-8 - J1R0X6			N-OB-9 - J1R0X7			N-OB-11 - J1R0X9			N-OB-12 - J1R100			S-OB-1 - J1R102		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
3,3'-Dichlorobenzidine	SVOA	655	U	655	659	U	659	657	U	657	662	U	662	655	U	655
3-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
4,6-Dinitro-2-methylphenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
4-Bromophenylphenyl ether	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
4-Chloro-3-methylphenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
4-Chloroaniline	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
4-Chlorophenylphenyl ether	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
4-Nitroaniline	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
4-Nitrophenol	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
Acenaphthene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Acenaphthylene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Anthracene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Benzo(a)anthracene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Benzo(a)pyrene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Benzo(b)fluoranthene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Benzo(ghi)perylene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Benzo(k)fluoranthene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Bis(2-chloro-1-methylethyl)ether	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Bis(2-Chloroethoxy)methane	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Bis(2-chloroethyl) ether	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Bis(2-ethylhexyl) phthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Butylbenzylphthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Carbazole	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Chrysene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Di-n-butylphthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Di-n-octylphthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Dibenz[a,h]anthracene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Dibenzofuran	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Diethyl phthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Dimethyl phthalate	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Fluoranthene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Fluorene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Hexachlorobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Hexachlorobutadiene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Hexachlorocyclopentadiene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Hexachloroethane	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Indeno(1,2,3-cd)pyrene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Isophorone	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
N-Nitroso-di-n-dipropylamine	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
N-Nitrosodiphenylamine	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Naphthalene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Nitrobenzene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Pentachlorophenol	SVOA	1640	U	1640	1650	U	1650	1640	U	1640	1660	U	1660	1640	U	1640
Phenanthrene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Phenol	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328
Pyrene	SVOA	328	U	328	330	U	330	328	U	328	331	U	331	328	U	328

Attachment	1	Sheet No.	29 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	Duplicate of J1R102 - J1R114			S-OB-2 - J1R103			S-OB-3 - J1R104			S-OB-4 - J1R105			S-OB-5 - J1R106		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1221	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1232	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1242	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1248	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1254	PCB	13.3	U	13.3	3.46	J	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1260	PCB	13.3	U	13.3	3.89	J	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1262	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aroclor-1268	PCB	13.3	U	13.3	13.1	U	13.1	13.4	U	13.4	13.3	U	13.3	13.3	U	13.3
Aldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Alpha-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
alpha-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Beta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Delta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDD	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDE	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
4-4'-DDT	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Dieldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endosulfan I	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endosulfan II	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endosulfan sulfate	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endrin aldehyde	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Endrin ketone	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
gamma-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Heptachlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Heptachlor epoxide	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Methoxychlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.33	UD	1.33	1.32	UD	1.32	1.32	UD	1.32
Toxaphene	PEST	13.2	UD	13.2	13.0	UD	13.0	13.3	UD	13.3	13.2	UD	13.2	13.2	UD	13.2
1,2,4-Trichlorobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
1,2-Dichlorobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
1,3-Dichlorobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
1,4-Dichlorobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,4,5-Trichlorophenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,4,6-Trichlorophenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,4-Dichlorophenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,4-Dimethylphenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,4-Dinitrophenol	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
2,4-Dinitrotoluene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2,6-Dinitrotoluene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2-Chloronaphthalene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2-Chlorophenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2-Methylnaphthalene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2-Methylphenol (cresol, o-)	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
2-Nitroaniline	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
2-Nitrophenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326

Attachment	1	Sheet No.	30 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	Duplicate of J1R102 - J1R114			S-OB-2 - J1R103			S-OB-3 - J1R104			S-OB-4 - J1R105			S-OB-5 - J1R106		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
3,3'-Dichlorobenzidine	SVOA	663	U	663	662	U	662	670	U	670	663	U	663	651	U	651
3-Nitroaniline	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
4,6-Dinitro-2-methylphenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
4-Bromophenylphenyl ether	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
4-Chloro-3-methylphenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
4-Chloroaniline	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
4-Chlorophenylphenyl ether	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
4-Nitroaniline	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
4-Nitrophenol	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
Acenaphthene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Acenaphthylene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Anthracene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Benzo(a)anthracene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Benzo(a)pyrene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Benzo(b)fluoranthene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Benzo(ghi)perylene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Benzo(k)fluoranthene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Bis(2-chloro-1-methylethyl)ether	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Bis(2-Chloroethoxy)methane	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Bis(2-chloroethyl) ether	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Bis(2-ethylhexyl) phthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Butylbenzylphthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Carbazole	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Chrysene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Di-n-butylphthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Di-n-octylphthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Dibenz[a,h]anthracene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Dibenzofuran	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Diethyl phthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Dimethyl phthalate	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Fluoranthene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Fluorene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Hexachlorobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Hexachlorobutadiene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Hexachlorocyclopentadiene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Hexachloroethane	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Indeno(1,2,3-cd)pyrene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Isophorone	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
N-Nitroso-di-n-dipropylamine	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
N-Nitrosodiphenylamine	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Naphthalene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Nitrobenzene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Pentachlorophenol	SVOA	1660	U	1660	1660	U	1660	1670	U	1670	1660	U	1660	1630	U	1630
Phenanthrene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Phenol	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326
Pyrene	SVOA	331	U	331	331	U	331	335	U	335	331	U	331	326	U	326

Attachment	1	Sheet No.	31 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	S-OB-6 - J1R107			S-OB-7 - J1R108			S-OB-8 - J1R109			S-OB-9 - J1R110			S-OB-10 - J1R111		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1221	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1232	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1242	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1248	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1254	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1260	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1262	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aroclor-1268	PCB	13.3	U	13.3	13.1	U	13.1	13.3	U	13.3	13.4	U	13.4	13.0	U	13.0
Aldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Alpha-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
alpha-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Beta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Delta-BHC	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
4-4'-DDD	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
4-4'-DDE	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
4-4'-DDT	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Dieldrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endosulfan I	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endosulfan II	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endosulfan sulfate	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endrin	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endrin aldehyde	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Endrin ketone	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Gamma-BHC (Lindane)	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
gamma-Chlordane	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Heptachlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Heptachlor epoxide	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Methoxychlor	PEST	1.32	UD	1.32	1.30	UD	1.30	1.32	UD	1.32	1.33	UD	1.33	1.29	UD	1.29
Toxaphene	PEST	13.2	UD	13.2	13.0	UD	13.0	13.2	UD	13.2	13.3	UD	13.3	12.9	UD	12.9
1,2,4-Trichlorobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
1,2-Dichlorobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
1,3-Dichlorobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
1,4-Dichlorobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,4,5-Trichlorophenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,4,6-Trichlorophenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,4-Dichlorophenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,4-Dimethylphenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,4-Dinitrophenol	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
2,4-Dinitrotoluene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2,6-Dinitrotoluene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2-Chloronaphthalene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2-Chlorophenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2-Methylnaphthalene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2-Methylphenol (cresol, o-)	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
2-Nitroaniline	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
2-Nitrophenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331

Attachment	1	Sheet No.	32 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	S-OB-6 - J1R107			S-OB-7 - J1R108			S-OB-8 - J1R109			S-OB-9 - J1R110			S-OB-10 - J1R111		
		8/30/12			8/30/12			8/30/12			8/30/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
3,3'-Dichlorobenzidine	SVOA	652	U	652	652	U	652	645	U	645	661	U	661	662	U	662
3-Nitroaniline	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
4,6-Dinitro-2-methylphenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
4-Bromophenylphenyl ether	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
4-Chloro-3-methylphenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
4-Chloroaniline	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
4-Chlorophenylphenyl ether	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
4-Nitroaniline	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
4-Nitrophenol	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
Acenaphthene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Acenaphthylene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Anthracene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Benzo(a)anthracene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Benzo(a)pyrene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Benzo(b)fluoranthene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Benzo(ghi)perylene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Benzo(k)fluoranthene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Bis(2-chloro-1-methylethyl)ether	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Bis(2-Chloroethoxy)methane	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Bis(2-chloroethyl) ether	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Bis(2-ethylhexyl) phthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Butylbenzylphthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Carbazole	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Chrysene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Di-n-butylphthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Di-n-octylphthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Dibenz[a,h]anthracene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Dibenzofuran	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Diethyl phthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Dimethyl phthalate	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Fluoranthene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Fluorene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Hexachlorobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Hexachlorobutadiene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Hexachlorocyclopentadiene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Hexachloroethane	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Indeno(1,2,3-cd)pyrene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Isophorone	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
N-Nitroso-di-n-dipropylamine	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
N-Nitrosodiphenylamine	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Naphthalene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Nitrobenzene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Pentachlorophenol	SVOA	1630	U	1630	1630	U	1630	1610	U	1610	1650	U	1650	1660	U	1660
Phenanthrene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Phenol	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331
Pyrene	SVOA	326	U	326	326	U	326	322	U	322	330	U	330	331	U	331

Attachment	1	Sheet No.	33 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	S-OB-11 - J1R112			S-OB-12 - J1R113			FS-1 - J1R0V4			Equipment Blank - J1R115		
		8/30/12			8/30/12			9/4/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1221	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1232	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1242	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1248	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1254	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1260	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1262	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aroclor-1268	PCB	13.2	U	13.2	13.3	U	13.3	13.7	U	13.7			
Aldrin	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Alpha-BHC	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
alpha-Chlordane	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Beta-BHC	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Delta-BHC	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
4-4'-DDD	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
4-4'-DDE	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
4-4'-DDT	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Dieldrin	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endosulfan I	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endosulfan II	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endosulfan sulfate	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endrin	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endrin aldehyde	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Endrin ketone	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Gamma-BHC (Lindane)	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
gamma-Chlordane	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Heptachlor	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Heptachlor epoxide	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Methoxychlor	PEST	1.31	UD	1.31	1.32	UD	1.32	1.36	U	1.36			
Toxaphene	PEST	13.1	UD	13.1	13.2	UD	13.2	13.6	UJ	13.6			
1,2,4-Trichlorobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
1,2-Dichlorobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
1,3-Dichlorobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
1,4-Dichlorobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,4,5-Trichlorophenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,4,6-Trichlorophenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,4-Dichlorophenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,4-Dimethylphenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,4-Dinitrophenol	SVOA	1650	U	1650	1640	U	1640	1710	UJ	1710	1640	U	1640
2,4-Dinitrotoluene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2,6-Dinitrotoluene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2-Chloronaphthalene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2-Chlorophenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2-Methylnaphthalene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2-Methylphenol (cresol, o-)	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
2-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1710	U	1710	1640	U	1640
2-Nitrophenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328

Attachment	1	Sheet No.	34 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 1. 100-D-50:1 Subsite Verification Sample Results (Organics).

LOCATION	CLASS	S-OB-11 - J1R112			S-OB-12 - J1R113			FS-1 - J1R0V4			Equipment Blank - J1R115		
		8/30/12			8/30/12			9/4/12			8/30/12		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3+4 Methylphenol (cresol, m+p)	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
3,3'-Dichlorobenzidine	SVOA	662	U	662	657	U	657	684	U	684	657	U	657
3-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1710	U	1710	1640	U	1640
4,6-Dinitro-2-methylphenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
4-Bromophenylphenyl ether	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
4-Chloro-3-methylphenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
4-Chloroaniline	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
4-Chlorophenylphenyl ether	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
4-Nitroaniline	SVOA	1650	U	1650	1640	U	1640	1710	U	1710	1640	U	1640
4-Nitrophenol	SVOA	1650	U	1650	1640	U	1640	1710	U	1710	1640	U	1640
Acenaphthene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Acenaphthylene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Anthracene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Benzo(a)anthracene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Benzo(a)pyrene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Benzo(b)fluoranthene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Benzo(ghi)perylene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Benzo(k)fluoranthene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Bis(2-chloro-1-methylethyl)ether	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Bis(2-Chloroethoxy)methane	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Bis(2-chloroethyl) ether	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Bis(2-ethylhexyl) phthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Butylbenzylphthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Carbazole	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Chrysene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Di-n-butylphthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Di-n-octylphthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Dibenz[a,h]anthracene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Dibenzofuran	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Diethyl phthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Dimethyl phthalate	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Fluoranthene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Fluorene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Hexachlorobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Hexachlorobutadiene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Hexachlorocyclopentadiene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Hexachloroethane	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Indeno(1,2,3-cd)pyrene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Isophorone	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
N-Nitroso-di-n-dipropylamine	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
N-Nitrosodiphenylamine	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Naphthalene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Nitrobenzene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Pentachlorophenol	SVOA	1650	U	1650	1640	U	1640	1710	U	1710	1640	U	1640
Phenanthrene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Phenol	SVOA	331	U	331	328	U	328	342	U	342	328	U	328
Pyrene	SVOA	331	U	331	328	U	328	342	U	342	328	U	328

Attachment	1	Sheet No.	35 of 35
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Americium-241			Carbon-14			Cesium-137			Cobalt-60			Europium-152			Europium-154		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test pit 3 pipe sediment	J10VF2	12/27/05	0.25	U	0.25	0.289	U	2.5	1.92		0.079	0.13	U	0.13	0.526		0.17	0.50	U	0.50
Duplicate of J10VF2	J10VF3	12/27/05	0.23	U	0.23	1.46	U	2.9	1.86		0.074	0.167		0.066	0.607		0.15	0.42	U	0.42
Test pit 1 pipe scabble	J10VF6	1/9/06	0.44	U	0.44	11.4	J	2.8	60.6		0.10	4.55		0.055	9.66		0.31	1.8	U	1.8
Test pit 1 underlying soil	J10VF0	12/27/05	0.18	U	0.18	200		4.6	0.031	U	0.031	0.032	U	0.032	0.12	U	0.12	0.12	U	0.12
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	0.24	U	0.24	1.53	U	3.3	1.28		0.13	0.12	U	0.12	0.42	U	0.42	0.38	U	0.38
Test pit 2 underlying soil [a]	J10VD9	12/27/05	0.14	U	0.14	271		5.4	0.023	U	0.023	0.027	U	0.027	0.059	U	0.059	0.082	U	0.082
Test pit 3 underlying soil	J10VD8	12/27/05	0.17	U	0.17	4180		5.3	0.047	U	0.047	0.050	U	0.050	0.11	U	0.11	0.19	U	0.19
Test pit 4 pipe sediment	J10VF1	12/27/05	0.066	U	0.066	-0.171	U	3.1	0.12	U	0.12	0.088	U	0.088	0.25	U	0.25	0.25	U	0.25
Test pit 4 underlying soil	J10VD6	12/27/05	0.059	U	0.059	79.2		5.8	0.043	U	0.043	0.049	U	0.049	0.16	U	0.16	0.16	U	0.16

Sample Location	HEIS Number	Sample Date	Europium-155			Gross alpha			Gross beta			Nickel-63			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test pit 3 pipe sediment	J10VF2	12/27/05	0.20	U	0.20	10.9		3.7	15.5		5.8	6.36		3.3	12	U	12	0.46	U	0.46
Duplicate of J10VF2	J10VF3	12/27/05	0.19	U	0.19	5.70		3.4	16.5		5.9	5.01		3.3	12	U	12	0.49	U	0.49
Test pit 1 pipe scabble	J10VF6	1/9/06	0.26	U	0.26	6.54		3.4	255		6.5	39.4	J	3.6	8.38		0.39	0.308		0.15
Test pit 1 underlying soil	J10VF0	12/27/05	0.13	U	0.13	13.4		3.1	16.6		5.4	-0.935	U	3.4	5.53		0.26	0.226		0.059
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	0.28	U	0.28	8.96		2.9	15.0		5.4	3.65		3.5	5.80		0.90	0.662		0.21
Test pit 2 underlying soil [a]	J10VD9	12/27/05	0.080	U	0.080	11.2		3.9	20.3		5.9	-0.218	U	3.7	15.9		0.26	0.538		0.048
Test pit 3 underlying soil	J10VD8	12/27/05	0.12	U	0.12	13.8		3.7	16.2		7.9	-1.00	U	3.4	14.2		0.44	0.645		0.10
Test pit 4 pipe sediment	J10VF1	12/27/05	0.14	U	0.14	6.03		4.0	9.68		8.0	1.98	U	3.5	1.2	U	1.2	0.15	U	0.15
Test pit 4 underlying soil	J10VD6	12/27/05	0.089	U	0.089	5.69		3.1	155		5.6	0	U	3.5	5.57		0.32	0.387		0.068

[a] Data from test pit 2 are for information only and are not included in the calculations as these data represent the area of the pipeline that has since been remediated.

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

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

B = method blank contamination (organic constituents)
C = method blank contamination (inorganic constituents)
D = diluted (organic constituents)
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
I = interference
J = estimate
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
R = rejected
U = undetected

Attachment	2	Sheet No.	1 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern NS	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Radium-228			Technetium-99			Thorium-228			Thorium-232			Total beta radiostrontium			Tritium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test pit 3 pipe sediment	J10VF2	12/27/05	0.69	U	0.69	0.033	U	0.41	0.248		0.12							-0.387	U	2.5
Duplicate of J10VF2	J10VF3	12/27/05	0.56	U	0.56	-0.009	U	0.56	0.316		0.078	0.56	U	0.56				-1.43	U	3.0
Test pit 1 pipe scabble	J10VF6	1/9/06	0.55	U	0.55	0.190	UJ	0.53	0.283		0.10	0.55	U	0.55	79.5		0.36	2.39	UJ	3.5
Test pit 1 underlying soil	J10VF0	12/27/05	0.29		0.13	-0.039	U	0.48	0.537		0.063	0.285		0.13				-0.916	U	2.7
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	0.52	U	0.52	0.011	U	0.53	0.20	U	0.20	0.52	U	0.52				0.213	U	3.3
Test pit 2 underlying soil [a]	J10VD9	12/27/05	0.763		0.12	-0.084	U	0.53	0.633		0.030	0.763		0.12				-0.528	U	3.1
Test pit 3 underlying soil	J10VD8	12/27/05	1.04		0.19	-0.076	U	0.52	0.754		0.051	1.04		0.19				0.722	U	3.2
Test pit 4 pipe sediment	J10VF1	12/27/05	0.31	U	0.31	-0.004	U	0.54	0.11	U	0.11	0.31	U	0.31				-1.88	U	3.2
Test pit 4 underlying soil	J10VD6	12/27/05	0.23	U	0.23	-0.127	U	0.53	0.709		0.062	0.23	U	0.23	1.66		0.33	0.062	U	3.2

Sample Location	HEIS Number	Sample Date	Uranium-233/234			Uranium-235			Uranium-235 GEA			Uranium-238			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Test pit 3 pipe sediment	J10VF2	12/27/05	0.242		0.17	0	U	0.20	0.24	U	0.24	0.264		0.17	8.6	U	8.6
Duplicate of J10VF2	J10VF3	12/27/05	0.498		0.19	0.060	U	0.23	0.22	U	0.22	0.448		0.19	7.5	U	7.5
Test pit 1 pipe scabble	J10VF6	1/9/06	0.407		0.044	0.033	U	0.042	0.33	U	0.33	0.494		0.044	8.7	U	8.7
Test pit 1 underlying soil	J10VF0	12/27/05	0.446		0.18	0.028	U	0.22	0.18	U	0.18	0.539		0.18	3.9	U	3.9
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	0.203		0.17	0.055	U	0.21	0.44	U	0.44	0.518		0.17	14	U	14
Test pit 2 underlying soil [a]	J10VD9	12/27/05	0.534		0.18	0.028	U	0.21	0.093	U	0.093	0.882		0.18	2.9	U	2.9
Test pit 3 underlying soil	J10VD8	12/27/05	0.504		0.17	0.080	U	0.20	0.18	U	0.18	0.701		0.17	5.5	U	5.5
Test pit 4 pipe sediment	J10VF1	12/27/05	0.194		0.18	0.059	U	0.22	0.23	U	0.23	0.121	U	0.18	9.5	U	9.5
Test pit 4 underlying soil	J10VD6	12/27/05	0.595		0.21	0	U	0.25	0.15	U	0.15	0.622		0.21	5.5	U	5.5

Attachment	2	Sheet No.	2 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium		
			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
Test pit 3 pipe sediment	J10VF2	12/27/05	6370		13.8	3.5		3.0	5.6	C	2.6	102		0.15	0.27		0.08	5.9		2.0	1.2		0.53
Duplicate of J10VF2	J10VF3	12/27/05	7050		15.1	3.3	U	3.3	7.0	C	2.8	116		0.16	0.25		0.08	6.7		2.2	1.4		0.58
Test pit 1 pipe scabble	J10VF6	1/9/06	5310		2.0	1.8	J	0.44	7.4		0.38	63.5		0.02	0.55		0.01	3.6		0.30	0.83		0.54
Test pit 1 underlying soil	J10VF0	12/27/05	4210		1.9	0.41	U	0.41	2.0	C	0.35	58.0		0.02	0.21		0.01	0.69		0.28	0.07	U	0.07
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	10500		16.4	3.6	U	3.6	7.9	C	3.1	159		0.18	0.40		0.09	8.8		2.4	2.2		0.63
Test pit 2 underlying soil [a]	J10VD9	12/27/05	5100		1.8	0.64		0.39	3.0	C	0.33	57.2		0.02	0.19		0.01	0.36		0.26	0.07	U	0.07
Test pit 3 underlying soil	J10VD8	12/27/05	5690		1.8	0.54		0.40	3.2	C	0.34	69.7		0.02	0.25		0.01	0.75		0.27	0.12		0.07
Test pit 4 pipe sediment	J10VF1	12/27/05	3840		13.8	22.6		3.0	44.0	C	2.6	58.7		0.15	0.12		0.08	5.6		2.0	0.53	U	0.53
Test pit 4 underlying soil	J10VD6	12/27/05	4990		1.8	0.39	U	0.39	2.4	C	0.33	85.3		0.02	0.33		0.01	0.92		0.26	0.13		0.07
Equipment blank	J10VD7	12/27/05	45.5		1.7	0.40		0.37	0.31	UC	0.31	1.8		0.02	0.03		0.009	0.25	U	0.25	0.06	U	0.06

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium			Iron			Lead		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	7660	C	8.9	97.5		1.2	8.5		0.90	57.3	C	0.90				29000		24.1	50.3		2.3
Duplicate of J10VF2	J10VF3	12/27/05	14100	C	9.8	103		1.3	8.1		0.99	52.3	C	0.99				24000		26.5	57.6		2.6
Test pit 3 pipe sediment	J10VF8	12/27/05													1.11	R	0.350						
Duplicate of J10VF8	J10VF9	12/27/05													1.31	R	0.350						
Test pit 4 pipe sediment	J11WP4	4/12/06													0.350	U	0.350						
Duplicate of J11WP4	J11WP5	4/12/06													0.350	U	0.350						
Test pit 1 pipe scabble	J10VF6	1/9/06	23100	C	1.3	66.6	J	0.18	7.4		0.13	123	J	0.13				37600	J	3.6	233	J	0.34
Test pit 1 pipe scabble	J10VH2	1/9/06													0.350	UJ	0.350						
Test pit 1 underlying soil	J10VF0	12/27/05	5210	C	1.2	8.5		0.17	6.8		0.12	14.6	C	0.12	0.22	U	0.22	18900		3.3	2.9		0.32
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	7930	C	10.7	375		1.4	15.1		1.1	96.7	C	1.1				45700		28.8	129		2.8
Test pit 2 pipe sediment [a]	J10VH0	12/27/05													0.753	R	0.350						
Test pit 2 underlying soil [a]	J10VD9	12/27/05	8100	C	1.2	11.3		0.16	4.8		0.12	11.7	C	0.12	0.21	U	0.21	13200		3.1	3.0		0.30
Test pit 3 underlying soil	J10VD8	12/27/05	4930	C	1.2	9.8		0.16	6.4		0.12	13.9	C	0.12	0.21		0.21	17400		3.2	3.9		0.31
Test pit 4 pipe sediment	J10VF1	12/27/05	12600	C	9.0	251		1.2	26.8		0.90	990	C	0.90				289000		24.2	47.1		2.3
Test pit 4 pipe sediment	J10VF7	12/27/05													0.827	R	0.350						
Test pit 4 underlying soil	J10VD6	12/27/05	4560	C	1.2	6.8		0.16	7.2		0.12	14.0	C	0.12	0.21	U	0.21	18100		3.1	4.3		0.30
Equipment blank	J11WP3	4/12/06													0.350	U	0.350						
Equipment blank	J10VD7	12/27/05	171	C	1.1	0.15	U	0.15	0.11	U	0.11	0.20	C	0.11				1090		3.0	1.2		0.29

Attachment	2	Sheet No.	3 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Magnesium			Manganese			Mercury			Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	5270		10.1	441	C	0.15	3.1		0.06	0.98	U	0.98	22.5		0.98	1320		41.6	2.7	U	2.7
Duplicate of J10VF2	J10VF3	12/27/05	5360		11.1	450	C	0.16	2.5		0.02	1.1	U	1.1	20.8		1.1	1470		45.7	3.0	U	3.0
Test pit 1 pipe scabble	J10VF6	1/9/06	5170	J	1.5	306		0.02	6.7	J	0.18	2.3		0.14	39.4	J	0.14	1070		6.1	0.64		0.40
Test pit 1 underlying soil	J10VF0	12/27/05	3760		1.4	279	C	0.02	0.02	U	0.02	0.13	U	0.13	10.0		0.13	722		5.7	0.37	U	0.37
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	6560		12.1	1030	C	0.18	6.1		0.11	1.2	U	1.2	37.8		1.2	2110		49.8	3.2	U	3.2
Test pit 2 underlying soil [a]	J10VD9	12/27/05	4060		1.3	248	C	0.02	0.01	U	0.01	0.13	U	0.13	10.5		0.13	1050		5.4	0.35	U	0.35
Test pit 3 underlying soil	J10VD8	12/27/05	3790		1.3	285	C	0.02	0.01	U	0.01	0.13	U	0.13	10.3		0.13	1080		5.5	0.36	U	0.36
Test pit 4 pipe sediment	J10VF1	12/27/05	2310		10.2	1610	C	0.15	1.2		0.02	20.7		0.98	368		0.98	929		41.7	2.7	U	2.7
Test pit 4 underlying soil	J10VD6	12/27/05	3910		1.3	335	C	0.02	0.02	U	0.02	0.18		0.13	9.4		0.13	1200		5.4	0.35	U	0.35
Equipment blank	J10VD7	12/27/05	70.2		1.3	68.7	C	0.02	0.02	U	0.02	0.12	U	0.12	0.12	U	0.12	16.0		5.1	0.33	U	0.33

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test pit 3 pipe sediment	J10VF2	12/27/05	518		6.2	1.1	U	1.1	349	C	1.3	37.6		0.68	249		0.38
Duplicate of J10VF2	J10VF3	12/27/05	603		6.8	1.2	U	1.2	425	C	1.4	36.1		0.74	270		0.41
Test pit 1 pipe scabble	J10VF6	1/9/06	1660	JC	0.91	0.49		0.16	434	C	0.19	31.7		0.1	75.7	J	0.06
Test pit 1 underlying soil	J10VF0	12/27/05	770		0.85	0.14	U	0.14	151	C	0.18	43.3		0.09	37.5		0.05
Test pit 2 pipe sediment [a]	J10VF4	12/27/05	687		7.4	1.3	U	1.3	486	C	1.5	54.8		0.81	467		0.45
Test pit 2 underlying soil [a]	J10VD9	12/27/05	782		0.80	0.14	U	0.14	158	C	0.17	25.1		0.09	31.9		0.05
Test pit 3 underlying soil	J10VD8	12/27/05	706		0.81	0.14	U	0.14	150	C	0.17	36.4		0.09	35.3		0.05
Test pit 4 pipe sediment	J10VF1	12/27/05	788		6.2	1.1	U	1.1	642	C	1.3	21.5		0.68	185		0.38
Test pit 4 underlying soil	J10VD6	12/27/05	597		0.80	0.14	U	0.14	145	C	0.17	37.2		0.09	36.9		0.05
Equipment blank	J10VD7	12/27/05	39.0		0.76	0.13	U	0.13	7.3	C	0.16	0.33		0.08	1.6		0.05

Attachment	2	Sheet No.	4 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VF6 Test Pit 1 Scabble Sample Date 1/9/06			J10VF0 Test Pit 1 Soil Sample Date 12/27/05			J10VD9 [a] Test Pit 2 Soil Sample Date 12/27/05			J10VD8 Test Pit 3 Soil Sample Date 12/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1221	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1232	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1242	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1248	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1254	110	U	110	15	U	15	14	U	14	14	U	14
Aroclor-1260	42	J	110	15	U	15	14	U	14	14	U	14
Pesticides												
Aldrin	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
alpha-BHC	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
alpha-Chlordane	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
beta-BHC	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
delta-BHC	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
4,4'-DDD	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
4,4'-DDE	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
4,4'-DDT	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Dieldrin	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endosulfan I	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endosulfan II	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endosulfan sulfate	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endrin	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endrin aldehyde	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Endrin ketone	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
gamma-BHC (Lindane)	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
gamma-Chlordane	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Heptachlor	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Heptachlor epoxide	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Methoxychlor	4.6	UD	4.6	7.3	UD	7.3	6.9	UD	6.9	6.9	UD	6.9
Toxaphene	46	UDJ	46	73	UD	73	69	UD	69	69	UD	69
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	380	U	380	360	U	360	350	U	350	350	U	350
1,2-Dichlorobenzene	380	U	380	360	U	360	350	U	350	350	U	350
1,3-Dichlorobenzene	380	U	380	360	U	360	350	U	350	350	U	350
1,4-Dichlorobenzene	380	U	380	360	U	360	350	U	350	350	U	350
2,4,5-Trichlorophenol	950	U	950	910	U	910	860	U	860	870	U	870
2,4,6-Trichlorophenol	380	U	380	360	U	360	350	U	350	350	U	350
2,4-Dichlorophenol	380	U	380	360	U	360	350	U	350	350	U	350
2,4-Dimethylphenol	380	U	380	360	U	360	350	U	350	350	U	350
2,4-Dinitrophenol	950	U	950	910	U	910	860	U	860	870	U	870
2,4-Dinitrotoluene	380	U	380	360	U	360	350	U	350	350	U	350
2,6-Dinitrotoluene	380	U	380	360	U	360	350	U	350	350	U	350
2-Chloronaphthalene	380	U	380	360	U	360	350	U	350	350	U	350
2-Chlorophenol	380	U	380	360	U	360	350	U	350	350	U	350
2-Methylnaphthalene	380	U	380	360	U	360	350	U	350	350	U	350
2-Methylphenol (cresol, o-)	380	U	380	360	U	360	350	U	350	350	U	350
2-Nitroaniline	950	U	950	910	U	910	860	U	860	870	U	870
2-Nitrophenol	380	U	380	360	U	360	350	U	350	350	U	350
3,3'-Dichlorobenzidine	380	U	380	360	U	360	350	U	350	350	U	350
3-Nitroaniline	950	U	950	910	U	910	860	U	860	870	U	870
4,6-Dinitro-2-methylphenol	950	U	950	910	U	910	860	U	860	870	U	870
4-Bromophenylphenyl ether	380	U	380	360	U	360	350	U	350	350	U	350
4-Chloro-3-methylphenol	380	U	380	360	U	360	350	U	350	350	U	350
4-Chloroaniline	380	U	380	360	U	360	350	U	350	350	U	350
4-Chlorophenylphenyl ether	380	U	380	360	U	360	350	U	350	350	U	350
4-Methylphenol (cresol, p-)	380	U	380	360	U	360	350	U	350	350	U	350
4-Nitroaniline	950	U	950	910	U	910	860	U	860	870	U	870
4-Nitrophenol	950	U	950	910	U	910	860	U	860	870	U	870

a Data from test pit 2 are for information only and are not included in the calculations as these data represent the area of the pipeline that has since been remediated.

Attachment	2	Sheet No.	5 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VF6 Test Pit 1 Scabble Sample Date 1/9/06			J10VF0 Test Pit 1 Soil Sample Date 12/27/05			J10VD9 [a] Test Pit 2 Soil Sample Date 12/27/05			J10VD8 Test Pit 3 Soil Sample Date 12/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
Acenaphthene	380	U	380	360	U	360	350	U	350	350	U	350
Acenaphthylene	380	U	380	360	U	360	350	U	350	350	U	350
Anthracene	380	U	380	360	U	360	350	U	350	350	U	350
Benzo(a)anthracene	380	U	380	360	U	360	350	U	350	350	U	350
Benzo(a)pyrene	380	U	380	360	U	360	350	U	350	350	U	350
Benzo(b)fluoranthene	380	U	380	360	U	360	350	U	350	350	U	350
Benzo(ghi)perylene	380	U	380	360	U	360	350	U	350	350	U	350
Benzo(k)fluoranthene	380	U	380	360	U	360	350	U	350	350	U	350
bis(2-Chloro-1-methylethyl)ether	380	U	380	360	U	360	350	U	350	350	U	350
bis(2-Chloroethoxy)methane	380	U	380	360	U	360	350	U	350	350	U	350
bis(2-Chloroethyl) ether	380	U	380	360	U	360	350	U	350	350	U	350
bis(2-Ethylhexyl) phthalate	660	U	660	970	B	360	1000	B	350	1500	B	350
Butylbenzylphthalate	380	U	380	360	U	360	350	U	350	350	U	350
Carbazole	380	U	380	360	U	360	350	U	350	350	U	350
Chrysene	380	U	380	360	U	360	350	U	350	350	U	350
Di-n-butylphthalate	51	J	380	360	U	360	20	JB	350	350	U	350
Di-n-octylphthalate	380	U	380	360	U	360	350	U	350	350	U	350
Dibenz[a,h]anthracene	380	U	380	360	U	360	350	U	350	350	U	350
Dibenzofuran	380	U	380	360	U	360	350	U	350	350	U	350
Diethylphthalate	380	U	380	360	U	360	350	U	350	350	U	350
Dimethyl phthalate	380	U	380	360	U	360	350	U	350	350	U	350
Fluoranthene	34	J	380	360	U	360	350	U	350	350	U	350
Fluorene	380	U	380	360	U	360	350	U	350	350	U	350
Hexachlorobenzene	380	U	380	360	U	360	350	U	350	350	U	350
Hexachlorobutadiene	380	U	380	360	U	360	350	U	350	350	U	350
Hexachlorocyclopentadiene	380	U	380	360	U	360	350	U	350	350	U	350
Hexachloroethane	380	U	380	360	U	360	350	U	350	350	U	350
Indeno(1,2,3-cd)pyrene	380	U	380	360	U	360	350	U	350	350	U	350
Isophorone	380	U	380	360	U	360	350	U	350	350	U	350
N-Nitroso-di-n-dipropylamine	380	U	380	360	U	360	350	U	350	350	U	350
N-Nitrosodiphenylamine	380	U	380	360	U	360	350	U	350	350	U	350
Naphthalene	380	U	380	360	U	360	350	U	350	350	U	350
Nitrobenzene	380	U	380	360	U	360	350	U	350	350	U	350
Pentachlorophenol	950	U	950	910	U	910	860	U	860	870	U	870
Phenanthrene	23	J	380	360	U	360	350	U	350	350	U	350
Phenol	380	U	380	360	U	360	350	U	350	350	U	350
Pyrene	22	J	380	360	U	360	350	U	350	350	U	350

Constituents	J10VF4 [a] Test Pit 2 Sediment Sample Date 12/27/05			J10VF2 Test Pit 3 Sediment Sample Date 12/27/05			J10VF3 Duplicate of J10VF2 Sample Date 12/27/05			J10VF1 Test Pit 4 Sediment Sample Date 12/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1221	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1232	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1242	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1248	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1254	64	U	64	53	U	53	59	U	59	53	U	53
Aroclor-1260	150		64	51	J	53	73		59	53	U	53
Pesticides												
Aldrin	32	UD	32	27	UD	27	30	UD	30	26	UD	26
alpha-BHC	32	UD	32	27	UD	27	30	UD	30	26	UD	26
alpha-Chlordane	32	UD	32	27	UD	27	30	UD	30	26	UD	26
beta-BHC	32	UD	32	27	UD	27	30	UD	30	26	UD	26
delta-BHC	32	UD	32	27	UD	27	30	UD	30	26	UD	26

Attachment	2	Sheet No.	6 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VF4 [a] Test Pit 2 Sediment Sample Date 12/27/05			J10VF2 Test Pit 3 Sediment Sample Date 12/27/05			J10VF3 Duplicate of J10VF2 Sample Date 12/27/05			J10VF1 Test Pit 4 Sediment Sample Date 12/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides (continued)												
4,4'-DDD	32	UD	32	27	UD	27	30	UD	30	26	UD	26
4,4'-DDE	28	JID	32	27	UD	27	30	UD	30	26	UD	26
4,4'-DDT	88	D	32	16	JD	27	22	JD	30	26	UD	26
Dieldrin	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Endosulfan I	11	JID	32	27	UD	27	30	UD	30	26	UD	26
Endosulfan II	14	JD	32	27	UD	27	30	UD	30	26	UD	26
Endosulfan sulfate	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Endrin	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Endrin aldehyde	41	ID	32	10	JD	27	17	JD	30	26	UD	26
Endrin ketone	77	ID	32	27	UD	27	30	UD	30	26	UD	26
gamma-BHC (Lindane)	32	UD	32	27	UD	27	30	UD	30	26	UD	26
gamma-Chlordane	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Heptachlor	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Heptachlor epoxide	32	UD	32	27	UD	27	30	UD	30	26	UD	26
Methoxychlor	32	UD	32	27	UD	27	30	UD	30	9.0	JD	26
Toxaphene	320	UD	320	270	UD	270	300	UD	300	260	UD	260
Herbicides												
2,4,5-Trichlorophenoxyacetic acid	260	UD	260	220	UD	220	250	UD	250	110	UD	110
2,4-Dichlorophenoxyacetic acid	530	UD	530	440	UD	440	490	UD	490	220	UD	220
2-(2,4,5-Trichlorophenoxy)propionic acid	260	UD	260	220	UD	220	250	UD	250	110	UD	110
2-secButyl-4,6-dinitrophenol(DNBP)	260	UD	260	220	UD	220	250	UD	250	110	UD	110
4-(2,4-Dichlorophenoxy)butanoic acid	2600	UD	2600	2200	UD	2200	2500	UD	2500	1100	UD	1100
Dalapon	2600	UD	2600	2200	UD	2200	2500	UD	2500	1100	UD	1100
Dicamba	1100	UD	1100	890	UD	890	990	UD	990	440	UD	440
Dichloroprop	2600	UD	2600	2200	UD	2200	2500	UD	2500	1100	UD	1100
Pentachlorophenol	210	UD	210	180	UD	180	200	UD	200	88	UD	88
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
1,2-Dichlorobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
1,3-Dichlorobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
1,4-Dichlorobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2,4,5-Trichlorophenol	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
2,4,6-Trichlorophenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2,4-Dichlorophenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2,4-Dimethylphenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2,4-Dinitrophenol	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
2,4-Dinitrotoluene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2,6-Dinitrotoluene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2-Chloronaphthalene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2-Chlorophenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2-Methylnaphthalene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2-Methylphenol (cresol, o-)	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
2-Nitroaniline	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
2-Nitrophenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
3,3'-Dichlorobenzidine	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
3-Nitroaniline	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
4,6-Dinitro-2-methylphenol	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
4-Bromophenylphenyl ether	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
4-Chloro-3-methylphenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
4-Chloroaniline	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
4-Chlorophenylphenyl ether	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
4-Methylphenol (cresol, p-)	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
4-Nitroaniline	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
4-Nitrophenol	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
Acenaphthene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Acenaphthylene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Anthracene	4700	JD	53000	250	JD	4400	20000	UD	20000	2200	UD	2200

Attachment	2	Sheet No.	7 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VF4 [a] Test Pit 2 Sediment Sample Date 12/27/05			J10VF2 Test Pit 3 Sediment Sample Date 12/27/05			J10VF3 Duplicate of J10VF2 Sample Date 12/27/05			J10VF1 Test Pit 4 Sediment Sample Date 12/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
Benzo(a)anthracene	34000	JD	53000	2700	JD	4400	1700	JD	20000	2200	UD	2200
Benzo(a)pyrene	32000	JD	53000	3000	JD	4400	1700	JD	20000	2200	UD	2200
Benzo(b)fluoranthene	38000	JD	53000	2800	JD	4400	2000	JD	20000	2200	UD	2200
Benzo(ghi)perylene	19000	JD	53000	1800	JD	4400	1100	JD	20000	2200	UD	2200
Benzo(k)fluoranthene	25000	JD	53000	2500	JD	4400	1800	JD	20000	2200	UD	2200
bis(2-Chloro-1-methylethyl)ether	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
bis(2-Chloroethoxy)methane	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
bis(2-Chloroethyl) ether	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
bis(2-Ethylhexyl) phthalate	2700	JBD	53000	880	JBD	4400	1500	JB	20000	840	JBD	2200
Butylbenzylphthalate	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Carbazole	5400	JD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Chrysene	39000	JD	53000	3200	JD	4400	2300	JD	20000	2200	UD	2200
Di-n-butylphthalate	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Di-n-octylphthalate	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Dibenz[a,h]anthracene	6400	JD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Dibenzofuran	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Diethylphthalate	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Dimethyl phthalate	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Fluoranthene	73000	D	53000	4400	D	4400	3600	JD	20000	2200	UD	2200
Fluorene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Hexachlorobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Hexachlorobutadiene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Hexachlorocyclopentadiene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Hexachloroethane	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Indeno(1,2,3-cd)pyrene	17000	JD	53000	1700	JD	4400	20000	UD	20000	2200	UD	2200
Isophorone	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
N-Nitroso-di-n-dipropylamine	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
N-Nitrosodiphenylamine	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Naphthalene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Nitrobenzene	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Pentachlorophenol	130000	UD	130000	11000	UD	11000	49000	UD	49000	5500	UD	5500
Phenanthrene	26000	JD	53000	850	JD	4400	20000	UD	20000	2200	UD	2200
Phenol	53000	UD	53000	4400	UD	4400	20000	UD	20000	2200	UD	2200
Pyrene	47000	JD	53000	3300	JD	4400	2300	JD	20000	2200	UD	2200

Attachment	2	Sheet No.	8 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VD6 Test Pit 4 Soil Sample Date 12/27/05		
	µg/kg	Q	PQL
Polychlorinated Biphenyls			
Aroclor-1016	14	U	14
Aroclor-1221	14	U	14
Aroclor-1232	14	U	14
Aroclor-1242	14	U	14
Aroclor-1248	14	U	14
Aroclor-1254	14	U	14
Aroclor-1260	14	U	14
Pesticides			
Aldrin	6.9	UD	6.9
alpha-BHC	6.9	UD	6.9
alpha-Chlordane	6.9	UD	6.9
beta-BHC	6.9	UD	6.9
delta-BHC	6.9	UD	6.9
4,4'-DDD	6.9	UD	6.9
4,4'-DDE	6.9	UD	6.9
4,4'-DDT	6.9	UD	6.9
Dieldrin	6.9	UD	6.9
Endosulfan I	6.9	UD	6.9
Endosulfan II	6.9	UD	6.9
Endosulfan sulfate	6.9	UD	6.9
Endrin	6.9	UD	6.9
Endrin aldehyde	6.9	UD	6.9
Endrin ketone	6.9	UD	6.9
gamma-BHC (Lindane)	6.9	UD	6.9
gamma-Chlordane	6.9	UD	6.9
Heptachlor	6.9	UD	6.9
Heptachlor epoxide	6.9	UD	6.9
Methoxychlor	6.9	UD	6.9
Toxaphene	69	UD	69
Semivolatile Organic Compounds			
1,2,4-Trichlorobenzene	350	U	350
1,2-Dichlorobenzene	350	U	350
1,3-Dichlorobenzene	350	U	350
1,4-Dichlorobenzene	350	U	350
2,4,5-Trichlorophenol	860	U	860
2,4,6-Trichlorophenol	350	U	350
2,4-Dichlorophenol	350	U	350
2,4-Dimethylphenol	350	U	350
2,4-Dinitrophenol	860	U	860
2,4-Dinitrotoluene	350	U	350
2,6-Dinitrotoluene	350	U	350
2-Chloronaphthalene	350	U	350
2-Chlorophenol	350	U	350
2-Methylnaphthalene	350	U	350
2-Methylphenol (cresol, o-)	350	U	350
2-Nitroaniline	860	U	860
2-Nitrophenol	350	U	350
3,3'-Dichlorobenzidine	350	U	350
3-Nitroaniline	860	U	860
4,6-Dinitro-2-methylphenol	860	U	860
4-Bromophenylphenyl ether	350	U	350
4-Chloro-3-methylphenol	350	U	350
4-Chloroaniline	350	U	350
4-Chlorophenylphenyl ether	350	U	350

Constituents	J10VD6 Test Pit 4 Soil Sample Date 12/27/05		
	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)			
4-Methylphenol (cresol, p-)	350	U	350
4-Nitroaniline	860	U	860
4-Nitrophenol	860	U	860
Acenaphthene	350	U	350
Acenaphthylene	350	U	350
Anthracene	350	U	350
Benzo(a)anthracene	350	U	350
Benzo(a)pyrene	350	U	350
Benzo(b)fluoranthene	350	U	350
Benzo(ghi)perylene	350	U	350
Benzo(k)fluoranthene	350	U	350
Bis(2-Chloro-1-methylethyl)ether	350	U	350
Bis(2-Chloroethoxy)methane	350	U	350
Bis(2-Chloroethyl) ether	350	U	350
Bis(2-Ethylhexyl) phthalate	910	B	350
Butylbenzylphthalate	350	U	350
Carbazole	350	U	350
Chrysene	350	U	350
Di-n-butylphthalate	350	U	350
Di-n-octylphthalate	350	U	350
Dibenz[a,h]anthracene	350	U	350
Dibenzofuran	350	U	350
Diethylphthalate	350	U	350
Dimethyl phthalate	350	U	350
Fluoranthene	350	U	350
Fluorene	350	U	350
Hexachlorobenzene	350	U	350
Hexachlorobutadiene	350	U	350
Hexachlorocyclopentadiene	350	U	350
Hexachloroethane	350	U	350
Indeno(1,2,3-cd)pyrene	350	U	350
Isophorone	350	U	350
N-Nitroso-di-n-dipropylamine	350	U	350
N-Nitrosodiphenylamine	350	U	350
Naphthalene	350	U	350
Nitrobenzene	350	U	350
Pentachlorophenol	860	U	860
Phenanthrene	350	U	350
Phenol	350	U	350
Pyrene	350	U	350

Attachment	2	Sheet No.	9 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Attachment 2. 100-D-50:1 Subsite Confirmatory Sample Results (Organics).

Constituents	J10VD7 Equipment Blank Sample Date 12/27/05		
	µg/kg	Q	PQL
Semivolatile Organic Compounds			
1,2,4-Trichlorobenzene	330	U	330
1,2-Dichlorobenzene	330	U	330
1,3-Dichlorobenzene	330	U	330
1,4-Dichlorobenzene	330	U	330
2,4,5-Trichlorophenol	830	U	830
2,4,6-Trichlorophenol	330	U	330
2,4-Dichlorophenol	330	U	330
2,4-Dimethylphenol	330	U	330
2,4-Dinitrophenol	830	U	830
2,4-Dinitrotoluene	330	U	330
2,6-Dinitrotoluene	330	U	330
2-Chloronaphthalene	330	U	330
2-Chlorophenol	330	U	330
2-Methylnaphthalene	330	U	330
2-Methylphenol (cresol, o-)	330	U	330
2-Nitroaniline	830	U	830
2-Nitrophenol	330	U	330
3,3'-Dichlorobenzidine	330	U	330
3-Nitroaniline	830	U	830
4,6-Dinitro-2-methylphenol	830	U	830
4-Bromophenylphenyl ether	330	U	330
4-Chloro-3-methylphenol	330	U	330
4-Chloroaniline	330	U	330
4-Chlorophenylphenyl ether	330	U	330
4-Methylphenol (cresol, p-)	330	U	330
4-Nitroaniline	830	U	830
4-Nitrophenol	830	U	830
Acenaphthene	330	U	330
Acenaphthylene	330	U	330
Anthracene	330	U	330
Benzo(a)anthracene	330	U	330
Benzo(a)pyrene	330	U	330
Benzo(b)fluoranthene	330	U	330
Benzo(ghi)perylene	330	U	330
Benzo(k)fluoranthene	330	U	330
Bis(2-Chloro-1-methylethyl)ether	330	U	330
Bis(2-Chloroethoxy)methane	330	U	330
Bis(2-Chloroethyl) ether	330	U	330
Bis(2-Ethylhexyl) phthalate	1100	B	330
Butylbenzylphthalate	330	U	330
Carbazole	330	U	330
Chrysene	330	U	330
Di-n-butylphthalate	26	JB	330
Di-n-octylphthalate	330	U	330
Dibenz[a,h]anthracene	330	U	330
Dibenzofuran	330	U	330
Diethylphthalate	330	U	330
Dimethyl phthalate	330	U	330
Fluoranthene	330	U	330
Fluorene	330	U	330
Hexachlorobenzene	330	U	330
Hexachlorobutadiene	330	U	330
Hexachlorocyclopentadiene	330	U	330
Hexachloroethane	330	U	330

Constituents	J10VD7 Equipment Blank Sample Date 12/27/05		
	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)			
Indeno(1,2,3-cd)pyrene	330	U	330
Isophorone	330	U	330
N-Nitroso-di-n-dipropylamine	330	U	330
N-Nitrosodiphenylamine	330	U	330
Naphthalene	330	U	330
Nitrobenzene	330	U	330
Pentachlorophenol	830	U	830
Phenanthrene	330	U	330
Phenol	330	U	330
Pyrene	330	U	330

Attachment	2	Sheet No.	10 of 10
Originator	J. D. Skoglie	Date	10/24/12
Checked	N. K. Schiffern	Date	10/24/12
Calc. No.	0100D-CA-V0482	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0483

Subject: 100-D-50:1 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	J. D. Skoglie	N. K. Schiffern	C. H. Dobie	D. F. Obenauer	4/2/13

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:	10/24/12	Calc. No.:	0100D-CA-V0483	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/24/12
Subject:	100-D-50:1 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-D-50:1 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.

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, 2012, *Remaining Sites Verification Package for the 100-D-50:1 Emergency Discharge Pipeline*, Attachment to Waste Site Reclassification Form 2006-028, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

Originator:	J. D. Skoglie	Date:	10/25/12	Calc. No.:	0100D-CA-V0483	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/25/12
Subject:	100-D-50:1 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The 100-D-50:1 subsite is comprised of four decision units for verification sampling; the excavation, staging pile area, north overburden, and south overburden. Confirmatory samples from four test pits were also collected at the 100-D-50:1 subsite in December 2005, and January and April 2006. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-50:1 subsite were conservatively calculated for the staging pile area, north overburden, and south overburden areas only, using the greater of the statistical or maximum value for each analyte in these decision units from the 100-D-50:1 site RSVP WCH (2012). Of the contaminants of potential concern (COPCs) for this site boron, molybdenum, nitrite as nitrogen, the detected polychlorinated biphenyls (PCBs), and the detected semivolatiles (SVOAs) require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Nitrate as nitrogen requires HQ and risk calculations because this analyte was detected above a Washington State or Hanford Site background value. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 2.23 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 3.1×10^{-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 5.3×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the maximum value for aroclor-1254 is 0.00346 mg/kg, divided by 0.5 mg/kg, and multiplied as indicated, produces an HQ value of 6.9×10^{-9}. Comparing this value, and all other individual values, to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 1.7×10^{-8}. Comparing these values to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

Table 1 shows the results of the calculations.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/12	Calc. No.:	0100D-CA-V0483	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/24/12
Subject:	100-D-50:1 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-D-50:1 Subsite.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.23	7,200	3.1E-04	--	--
Molybdenum	0.893	400	2.2E-03	--	--
Semivolatiles					
Bis(2-ethylhexyl) phthalate	0.147	1,600	9.2E-05	71.4	2.1E-09
Diethylphthalate	0.0647	64,000	1.0E-06	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.00346	1.6	2.2E-03	0.5	6.9E-09
Aroclor-1260	0.00389	--	--	0.5	7.8E-09
Anions					
Nitrate as nitrogen[c]	43.9	128,000	3.4E-04	--	--
Nitrite as nitrogen[c]	0.9	8,000	1.1E-04	--	--
Totals					
Cumulative Hazard Quotient:			**5.3E-03**		
Cumulative Excess Cancer Risk:					**1.7E-08**

Notes:

[a] = From WCH (2012).

[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] = These are values obtained from converting "nitrate" to "nitrate as nitrogen" and "nitrite" to "nitrite as nitrogen".

-- = not applicable

RAG = remedial action goal

CONCLUSION:

The calculation in Table 1 demonstrates that the 100-D-50:1 subsite meets the requirements for the direct contact hazard quotients and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009b) and SAP (DOE-RL 2009a). The direct contact hazard quotient and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0484

Subject: 100-D-50:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	N. D. Skoglie	N. K. Schiffern	C. H. Dobie	D. F. Obenauer	4/2/13

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:	10/25/2012	Calc. No.:	0100D-CA-V0484	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/25/2012
Subject:	100-D-50:1 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-50:1 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, 2012, *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculation*, 0100D-CA-V0482, 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:	10/25/2012	Calc. No.:	0100D-CA-V0484	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/25/2012
Subject:	100-D-50:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-D-50:1 subsite is comprised of four decision units for verification sampling; the excavation, staging pile area, north overburden, and south overburden. Confirmatory samples from four test pits were also collected at the 100-D-50:1 subsite in December 2005, and January and April 2006. Test pit 2 was for information only as this area of the pipeline has since been remediated. Also included within the excavation is focused sample 1. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-D-50:1 subsite were conservatively calculated for the entire waste site (except test pit 2 and pipe sediment samples) using the greater of the statistical or maximum value for each analyte in the 95% UCL calculation (WCH 2012). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, diethyl phthalate, and nitrite as nitrogen are included because no Hanford background value has been established and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (BHI 2005). Based on this model and a vadose zone of approximately 14 m (46 ft) thickness, a K_d value of 5.3 mL/g is adequate to show no migration to groundwater in 1,000 years using the generic RESRAD model (BHI 2005). Contaminants with a K_d of 5.3 mL/g are highly adsorbed to soil particles, and even when immersed in water, any migration will be negligible. Therefore, HQ and risk calculations were performed with the exclusion of these analytes with a K_d over 5.3 mL/g. Nitrate as nitrogen was quantitated at a concentration above Hanford Site background and has a K_d less than 5.3. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 5.3. 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 2.25 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg produces an HQ value of 7.0×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The cumulative HQ for the 100-D-50:1 subsite is 7.4×10^{-2}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, and then multiplied by 1×10^{-6}. The 100-D-50:1 subsite does not have any constituents with carcinogen RAGs, the criterion for excess cancer risk is met. Consequently, the criterion for cumulative excess cancer risk for carcinogens is also met.

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/25/2012	Calc. No.:	0100D-CA-V0484	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	N. K. Schiffern	Date:	10/25/2012
Subject:	100-D-50:1 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 3 of 3	

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

RESULTS:

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

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-D-50:1 Subsite.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.25	320	7.0E-03	--	--
Chromium, hexavalent [c]	0.21	4.8	4.4E-02	--	--
Semivolatiles					
Diethylphthalate	0.0647	1,280	5.1E-05	--	--
Anions					
Nitrate as nitrogen [d]	43.9	2,560	1.7E-02	--	--
Nitrite as nitrogen [d]	0.9	160	5.6E-03	--	--
Totals					
Cumulative Hazard Quotient:			**7.4E-02**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:
[a] = From WCH (2012).
[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.
[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.
[d] = These values have been obtained from converting "nitrate" to "nitrogen in nitrate" and "nitrite" to "nitrogen in nitrite".
-- = not applicable
RAG = remedial action goal

CONCLUSION:

The calculation in Table 1 demonstrates that the 100-D-50:1 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).

CALCULATION COVER SHEET

Project Title 100-D Area Field Remediation **Job No.** 14655
Area 100-D Area
Discipline Environmental ***Calc. No.** 0100D-CA-V0272
Subject 100-D-50:1 Service Area 1 RESRAD Calculation
Computer Program RESRAD **Program No.** Version 6.5

The attached calculations have been generated to document compliance with established cleanup levels.
These documents 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 pg Summary – 4 pg Attm. 1 – 1 pg Attm. 2 – 20 pg Attm. 3 – 27 pg Attm. 4 – 9 pg Total – 62 pages	*(Signed)* M.W. Perrott	*(Signed)* S. W. Clark	*(Signed)* T. M. Blakley	*(Signed)* L.M. Dittmer	*(Approved)* 7/26/2006
1	Cover – 1 pg Summary – 4 pg Attm. 1 – 24 pg Attm. 2 – 11 pg Total – 40 pages	S. W. Clark	M.W. Perrott	H. M. Sulloway	D. F. Obenauer	10/10/12

SUMMARY OF REVISION	
1	Revision 1 was necessary to include tritium (H-3) analyses in the radionuclide dose and groundwater protection calculations using the RESidual RADioactivity (RESRAD) software. For convenience the calculation brief has been replaced in its entirety

*Obtain Calc. No. from DIS

DE01-437.03 (12/09/2004)

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark SWC	Date:	10/10/12	Calc. No.:	0100D-CA-V0272	Rev.:	1
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	M.W. Perrott MWP	Date:	10/10/12
Subject:	100-D-50:1 Service Area 1 RESRAD Calculation					Sheet No. 1 of 4	

PURPOSE:

Calculate the radiological dose contributions and groundwater concentrations over a period of 1,000 years from remaining radionuclide contamination in the vadose zone at the 100-D-50:1 Service Area 1 site.

GIVEN/REFERENCES:

1) Maximum radionuclide concentrations were obtained from previous confirmatory sampling results and from current verification sampling results reported in the Results Summary of the *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations*, Calc. No. 0100D-CA-V0482, Rev. 0, Washington Closure Hanford, Richland, Washington (WCH 2012).
2) Predicted radionuclide dose and radionuclide concentrations in groundwater were determined using the RESidual RADioactivity (RESRAD) computer code, version 6.5, developed for the U.S. Department of Energy by the Environmental Assessment Division of Argonne National Laboratory, Argonne, Illinois, and accessed at < http://www.ead.anl.gov/resrad >.
3) RESRAD modeling evaluations for radionuclides were performed as described in Appendix B of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009) to predict the all-pathways radiological dose over a period of 1,000 years and to predict the concentrations in groundwater due to radionuclides in the soil.
4) For the purpose of these RESRAD calculations, the sampling area for the 100-D-50:1 service area 1 Deep Zone excavation is 1,333 m^2, based upon the *Work Instruction for the 100-D-50:1 Emergency Discharge Pipeline,* Calculation No. 0100D-WI-G0013, Rev. 0, Washington Closure Hanford, Richland, Washington (WCH 2005).
5) The thickness of the contaminated deep zone was determined using test pit and borehole data from the *Cleanup Verification Package for the 116-D-7 Retention Basin,* CVP -99-00007, Rev. 0, Bechtel Hanford, Inc., Richland, Washington (BHI 2000).

SOLUTION:

1) Table 1 shows the waste site parameters used for RESRAD modeling. Based on the worst case assumption (discussed in the 100 Area RDR/RAWP [DOE-RL 2009]) that residual contamination levels from the deep zone data set extend uniformly to groundwater, RESRAD predicted that the residual soil concentrations for strontium-90 would result in groundwater concentrations that exceed the drinking water standard. Therefore the site specific approach (also discussed in the 100 Area RDR/RAWP) has been used. Test pit data from the 116-D-7 Retention Basin was used to determine the thickness of the uncontaminated deep zone between the

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	10/10/12	Calc. No.:	0100D-CA-V0272	Rev.:	1
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	M.W. Perrott	Date:	10/10/12
Subject:	100-D-50:1 Service Area 1 RESRAD Calculation					Sheet No. 2 of 4	

contaminated deep zone and groundwater to more accurately describe the 100-D-50:1 site for modeling using RESRAD.

2) Table 2 shows the maximum radionuclide contaminant concentrations. Input factors for the RESRAD modeling run are shown in the "Summary" section of the RESRAD "Mixture Sums and Single Radionuclide Guidelines" printout in the Attachments to this Calculation Summary.
3) The year when the peak dose or concentration occurs for each radionuclide was determined by a preliminary RESRAD run. The modeling for the 100-D-50:1 service area 1 waste site indicates that only tritium of the radionuclide analytes is predicted to migrate to groundwater and exhibit a peak dose and concentration within 1,000 years. Peak dose and concentration for tritium are predicted to occur at year 27.62. This year was included in the RESRAD evaluation for the 100-D-50:1 Service Area 1 site.

Table 1. Waste Site Dimensions for RESRAD Modeling

Parameter	Units	Value	Comments
Shallow Zone Cover Depth	m	0	
Area of Deep Zone	m^2	1,333	Based upon Sample Design drawings [a]
Thickness: Shallow Zone	m	4.6	Appendix B of 100 Area RDR/RAWP
Elevation: Ground Surface	m	143.0	NAVD88
Elevation: Excavation Bottom	m	135.7	NAVD88
Elevation: Groundwater	m	118.3	NAVD88
Thickness: Total Deep Zone	m	20.1	Vadose zone thickness minus shallow zone
Thickness: Uncontaminated Deep Zone	m	14.4	Based on deep zone model from 116-D-7 test pit [b]
Thickness: Contaminated Deep Zone	m	5.7	Excavation depth minus shallow zone plus maximum contaminant leach depth (3m) [b]
Length Parallel to Aquifer Flow	m	160	Based on Sample Design drawings [a]

[a] Sample design data from the *Work Instruction for the 100-D-50:1 Emergency Discharge Pipeline*, Calculation No. 0100D-WI-G0013, Rev. 0, Washington Closure Hanford, Richland, Washington (WCH 2005).

[b] Two-layer deep zone model based on test pit data from the *Cleanup Verification Package for the 116-D-7 Retention Basin, CVP-99-00007*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington (BHI 2000).

METHODOLOGY:

1) A final run of RESRAD version 6.5 was completed for the deep zone using the radionuclide activities shown in Table 2. RESRAD numerical output reports for dose and concentration for the deep zone are presented in the Attachments to this calculation summary.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	10/10/12	Calc. No.:	0100D-CA-V0272	Rev.:	1
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	M.W. Perrott	Date:	10/10/12
Subject:	100-D-50:1 Service Area 1 RESRAD Calculation					Sheet No. 3 of 4	

Table 2. Maximum Radionuclide Activities

Radionuclides	Maximum Deep Zone Activities (pCi/g) [a]
C-14	4,180
Cs-137	60.6
Co-60	4.55
Eu-152	9.66
H-3 (Tritium)	4.64
Ni-63	39.4
Sr-90	79.5
U-233/234	0.683 [b]
U-235	0.114 [b]
U-238	0.752 [b]

[a] Maximum of confirmatory or verification sampling data from the 100-D-50:1 sample results.
[b] Value was not input into RESRAD because all analyses were below Hanford Site background levels.

RESULTS:

1) Radionuclide "All Pathways" Dose Rate:
The maximum all-pathways predicted dose rate is 0.163 mrem/yr shown in Table 3. Radiological dose is only predicted to occur during the time period of the peak dose contribution due to tritium at year 27.62 and is much less than the dose limitation of 15 mrem/yr.

Table 3. All Pathway Dose Rate (mrem/yr)

Vadose Zone Horizon	Predicted "All Pathways" Dose Contributions in mrem/yr at each time slice (yr)							
	0	1	10	27	27.62	28	100	1000
Deep Zone	0	0	0	0.154	0.163	0.156	0	0

2) Radionuclide Groundwater Protection:
The radionuclide concentrations in groundwater calculated by the RESRAD model are summarized in Table 4. Only tritium is predicted to reach groundwater in the 1,000 years of the RESRAD model evaluation. Peak tritium concentration in groundwater is predicted to be 2,667 pCi/L at year 27.62, which is below the remedial action goal (RAG) of 20,000 pCi/L. Calculation of cumulative organ specific dose via the groundwater pathway was not necessary because tritium is the only COPC predicted to reach groundwater and the drinking water RAG is predicted to be met.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	10/10/12	Calc. No.:	0100D-CA-V0272	Rev.:	1
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	M.W. Perrott	Date:	10/10/12
Subject:	100-D-50:1 Service Area 1 RESRAD Calculation					Sheet No. 4 of 4	

Table 4. RESRAD Predicted Radionuclide Groundwater (Well Water) Concentrations

Radio-nuclides	Vadose Zone Horizon	Groundwater Concentrations in pCi/L at Each Time Slice (yr)								[a] RAGs, pCi/L
		0	1	10	27	27.62	28	100	1000	
C-14	Deep	0	0	0	0	0	0	0	0	2000
Co-60	Deep	0	0	0	0	0	0	0	0	100
Cs-137	Deep	0	0	0	0	0	0	0	0	60
Eu-152	Deep	0	0	0	0	0	0	0	0	200
H-3	Deep	0	0	0	2,517	2,667	2,547	0.246	0	20,000
Ni-63	Deep	0	0	0	0	0	0	0	0	50
Sr-90	Deep	0	0	0	0	0	0	0	0	8

[a] Based on radionuclide drinking water RAGs, as discussed in Appendix B and Table B-6, of the RDR/RAWP (DOE-RL 2009).

CONCLUSIONS:

- With the exception of tritium, none of the radionuclides in soil are predicted to migrate to groundwater in the 1,000 years of the RESRAD model run.
- The maximum all-pathways dose rate for the deep zone shown in Table 3 is predicted to be 0.163 mrem/yr, which is much less than the 15 mrem/yr dose limitation.
- None of the site radionuclides are projected to exceed remedial action goals (RAGs).
- Only tritium is predicted to migrate to groundwater. Peak concentration of tritium in groundwater is predicted to be 2,667 pCi/L at year 27.62, which is below the drinking water RAG of 20,000 pCi/L. Calculation of cumulative organ specific dose via the groundwater pathway was not necessary because tritium is the only COPC predicted to reach groundwater and the drinking water RAG is predicted to be met.

ATTACHMENTS:

1. RESRAD Output: 100-D-50:1 Service Area 1 Deep Zone Radionuclides, Mixture Sums and Single Radionuclide Guidelines (24 pages)
2. RESRAD Output: 100-D-50:1 Service Area 1 Deep Zone Radionuclides, Concentration of Radionuclides, (11 pages)

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       10/09/2012  13:00  Page   1
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	C-14 (Source: FGR 12)	1.345E-05	1.345E-05	DCF1(2)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(3)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(4)
A-1	Eu-152 (Source: FGR 12)	7.006E+00	7.006E+00	DCF1(5)
A-1	Gd-152 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(6)
A-1	H-3 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(7)
A-1	Ni-63 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(8)
A-1	Sr-90 (Source: FGR 12)	7.043E-04	7.043E-04	DCF1(9)
A-1	Y-90 (Source: FGR 12)	2.391E-02	2.391E-02	DCF1(10)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	C-14(p) (Class: ORGANIC)	2.090E-06	2.090E-06	DCF2(1)
B-1	C-14(g) (Class: CO2)	2.350E-08	2.350E-08	C14GInhDCF
B-1	Co-60	2.190E-04	2.190E-04	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(4)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(6)
B-1	H-3	6.400E-08	6.400E-08	DCF2(7)
B-1	Ni-63	6.290E-06	6.290E-06	DCF2(8)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	C-14	2.090E-06	2.090E-06	DCF3(1)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(4)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(6)
D-1	H-3	6.400E-08	6.400E-08	DCF3(7)
D-1	Ni-63	5.770E-07	5.770E-07	DCF3(8)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(1,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(1,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(1,3)
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(2,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(2,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(2,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(3,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(4,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(4,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(4,3)

Attachment 1 Sheet No. 2 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page   3
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter		Current Value#	Base Case*	Parameter Name
D-34	Gd-152	, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	Gd-152	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(6,2)
D-34	Gd-152	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(6,3)
D-34					
D-34	H-3	, plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(7,1)
D-34	H-3	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(7,2)
D-34	H-3	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(7,3)
D-34					
D-34	Ni-63	, plant/soil concentration ratio, dimensionless	5.000E-02	5.000E-02	RTF(8,1)
D-34	Ni-63	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(8,2)
D-34	Ni-63	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-02	2.000E-02	RTF(8,3)
D-34					
D-34	Sr-90+D	, plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(9,1)
D-34	Sr-90+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(9,2)
D-34	Sr-90+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:				
D-5	C-14	, fish	5.000E+04	5.000E+04	BIOFAC(1,1)
D-5	C-14	, crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(1,2)
D-5					
D-5	Co-60	, fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Co-60	, crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(2,2)
D-5					
D-5	Cs-137+D	, fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D	, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5					
D-5	Eu-152	, fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Eu-152	, crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(4,2)
D-5					
D-5	Gd-152	, fish	2.500E+01	2.500E+01	BIOFAC(6,1)
D-5	Gd-152	, crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(6,2)
D-5					
D-5	H-3	, fish	1.000E+00	1.000E+00	BIOFAC(7,1)
D-5	H-3	, crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(7,2)
D-5					
D-5	Ni-63	, fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Ni-63	, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5					
D-5	Sr-90+D	, fish	6.000E+01	6.000E+01	BIOFAC(9,1)
D-5	Sr-90+D	, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(9,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment	1	Sheet No.	3 of 24
Originator:	S. W. Clark	Date	10/11/12
Chk'd By:	M. W. Perrott	Date	10/11/12
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 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.333E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.700E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	1.600E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	2.700E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	2.762E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	2.800E+01	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	3.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): C-14	4.180E+03	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Co-60	4.550E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	6.060E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Eu-152	9.660E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): H-3	4.640E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Ni-63	3.940E+01	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Sr-90	7.950E+01	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): C-14	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Ni-63	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(9)
R013	Cover depth (m)	4.600E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.600E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	1.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	3.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.100E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS

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Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
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File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	1.500E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.530E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.250E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.050E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	4.600E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	1.440E+01	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.600E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.500E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	1.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.050E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+02	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.379E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.748E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.748E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.379E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Attachment 1 Sheet No. 5 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days       10/09/2012  13:00  Page   6
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.238E-02	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Ni-63				
R016	Contaminated zone (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.909E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.488E-04	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.062E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.000E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Attachment 1 Sheet No. 6 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   7
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	fruits, vegetables and grain consumption (kg/yr)	1.100E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	2.700E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	1.000E+02	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	3.600E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	1.970E+01	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	7.300E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.300E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.666E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.666E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

Attachment 1 Sheet No. 7 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   8
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	2.000E-05	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	3.000E-02	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	2.000E-02	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	9.800E-01	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	3.000E-01	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	7.000E-07	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	1.000E-10	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	8.000E-01	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	2.000E-01	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Attachment 1 Sheet No. 8 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   9
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	5	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
find peak pathway doses	suppressed

Attachment 1 Sheet No. 9 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days       10/09/2012  13:00  Page  10
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Contaminated Zone Dimensions

Area:	1333.00 square meters
Thickness:	5.70 meters
Cover Depth:	4.60 meters

Initial Soil Concentrations, pCi/g

C-14	4.180E+03
Co-60	4.550E+00
Cs-137	6.060E+01
Eu-152	9.660E+00
H-3	4.640E+00
Ni-63	3.940E+01
Sr-90	7.950E+01

0

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	2.700E+01	2.762E+01	2.800E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	5.482E-24	4.871E-24	3.846E-24	1.687E-24	1.535E-01	1.626E-01	1.557E-01	1.503E-05	1.053E-16	0.000E+00
M(t):	3.655E-25	3.247E-25	2.564E-25	1.125E-25	1.023E-02	1.084E-02	1.038E-02	1.002E-06	7.021E-18	0.000E+00

0Maximum TDOSE(t): 1.626E-01 mrem/yr at t = 27.65 ñ 0.06 years

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.765E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	2.009E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.035E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.213E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Attachment 1	Sheet No. 10 of 24
Originator: S. W. Clark	Date 10/11/12
Chk'd By: M. W. Perrott	Date 10/11/12
Calc. No. 0100D-CA-V0272	Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page  11
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.765E+01 years

0 Water Dependent Pathways

0 Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.009E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.035E-26	0.0000
H-3	1.245E-01	0.7654	5.815E-06	0.0000	0.000E+00	0.0000	3.649E-02	0.2244	3.949E-04	0.0024	1.256E-03	0.0077	1.626E-01	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.245E-01	0.7654	5.815E-06	0.0000	0.000E+00	0.0000	3.649E-02	0.2244	3.949E-04	0.0024	1.256E-03	0.0077	1.626E-01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 11 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  12
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	5.423E-24	0.9892	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	5.918E-26	0.0108	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.482E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.423E-24	0.9892
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.918E-26	0.0108
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.482E-24	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	12 of 24
Originator:	S. W. Clark	Date	10/11/12
Chk'd By:	M. W. Perrott	Date	10/11/12
Calc. No.	0100D-CA-V0272	Rev. No.	1

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page  13
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	4.814E-24	0.9883	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	5.694E-26	0.0117	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.871E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.814E-24	0.9883
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.694E-26	0.0117
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.871E-24	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	13 of 24
Originator:	S. W. Clark	Date	10/11/12
Chk'd By:	M. W. Perrott	Date	10/11/12
Calc. No.	0100D-CA-V0272	Rev. No.	1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       10/09/2012  13:00  Page  14
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0 Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	3.793E-24	0.9863	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	5.271E-26	0.0137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.846E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

0 Water Dependent Pathways

0 Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.793E-24	0.9863
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.271E-26	0.0137
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.846E-24	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	14 of 24
Originator:	S. W. Clark	Date	10/11/12
Chk'd By:	M. W. Perrott	Date	10/11/12
Calc. No.	0100D-CA-V0272	Rev. No.	1

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 10/09/2012 13:00 Page 15
Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.647E-24	0.9762	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	4.023E-26	0.0238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.687E-24	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.647E-24	0.9762
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.023E-26	0.0238
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.687E-24	1.0000

*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 15 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  16
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and fraction of Total Dose At t = 2.700E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	2.171E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.087E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.379E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and fraction of Total Dose At t = 2.700E+01 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.171E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.087E-26	0.0000
H-3	1.175E-01	0.7660	5.483E-06	0.0000	0.000E+00	0.0000	3.436E-02	0.2239	3.707E-04	0.0024	1.184E-03	0.0077	1.535E-01	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.175E-01	0.7660	5.483E-06	0.0000	0.000E+00	0.0000	3.436E-02	0.2239	3.707E-04	0.0024	1.184E-03	0.0077	1.535E-01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 16 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       10/09/2012  13:00  Page  17
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.762E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	2.016E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.038E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.220E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.762E+01 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.016E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.038E-26	0.0000
H-3	1.245E-01	0.7658	5.811E-06	0.0000	0.000E+00	0.0000	3.643E-02	0.2240	3.939E-04	0.0024	1.255E-03	0.0077	1.626E-01	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.245E-01	0.7658	5.811E-06	0.0000	0.000E+00	0.0000	3.643E-02	0.2240	3.939E-04	0.0024	1.255E-03	0.0077	1.626E-01	1.0000

*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 17 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  18
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.800E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.927E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	2.008E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.127E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.800E+01 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.927E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.008E-26	0.0000
H-3	1.190E-01	0.7643	5.574E-06	0.0000	0.000E+00	0.0000	3.510E-02	0.2254	3.881E-04	0.0025	1.213E-03	0.0078	1.557E-01	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.190E-01	0.7643	5.574E-06	0.0000	0.000E+00	0.0000	3.510E-02	0.2254	3.881E-04	0.0025	1.213E-03	0.0078	1.557E-01	1.0000

*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 18 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 10/09/2012 13:00 Page 19
Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	3.611E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	1.246E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.283E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.611E-29	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.246E-27	0.0000
H-3	1.148E-05	0.7643	5.378E-10	0.0000	0.000E+00	0.0000	3.386E-06	0.2254	3.745E-08	0.0025	1.170E-07	0.0078	1.503E-05	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.148E-05	0.7643	5.378E-10	0.0000	0.000E+00	0.0000	3.386E-06	0.2254	3.745E-08	0.0025	1.170E-07	0.0078	1.503E-05	1.0000

*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 19 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  20
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	8.050E-17	0.7643	3.769E-21	0.0000	0.000E+00	0.0000	2.373E-17	0.2254	2.625E-19	0.0025	8.201E-19	0.0078	1.053E-16	1.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	8.050E-17	0.7643	3.769E-21	0.0000	0.000E+00	0.0000	2.373E-17	0.2254	2.625E-19	0.0025	8.201E-19	0.0078	1.053E-16	1.0000

*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 20 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

1RESRAD, Version 6.5 T½ Limit = 180 days 10/09/2012 13:00 Page 21
Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment 1 Sheet No. 21 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  22
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	2.700E+01	2.762E+01	2.800E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Co-60	Co-60	1.000E+00	1.192E-24	1.058E-24	8.336E-25	3.619E-25	4.770E-26	4.431E-26	4.234E-26	7.936E-30	3.518E-40	0.000E+00
0Cs-137+D	Cs-137+D	1.000E+00	9.271E-31	9.196E-31	9.048E-31	8.551E-31	7.454E-31	7.416E-31	7.394E-31	4.132E-31	8.211E-32	2.872E-34
0Eu-152	Eu-152	7.208E-01	4.416E-27	4.249E-27	3.933E-27	3.002E-27	1.557E-27	1.520E-27	1.498E-27	9.301E-29	4.126E-32	7.567E-44
0Eu-152	Eu-152	2.792E-01	1.710E-27	1.646E-27	1.523E-27	1.163E-27	6.032E-28	5.889E-28	5.804E-28	3.603E-29	1.598E-32	2.943E-44
Eu-152	Gd-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	ëDSR(j)		1.710E-27	1.646E-27	1.523E-27	1.163E-27	6.032E-28	5.889E-28	5.804E-28	3.603E-29	1.598E-32	2.943E-44
0H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.308E-02	3.505E-02	3.356E-02	3.238E-06	2.270E-17	0.000E+00
0Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Sr-90+D	Sr-90+D	1.000E+00	2.825E-40	2.811E-40	2.781E-40	2.680E-40	2.451E-40	2.443E-40	2.438E-40	1.668E-40	5.810E-41	1.450E-42

The DSR includes contributions from associated (half-life ó 180 days) daughters.

0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	2.700E+01	2.762E+01	2.800E+01	1.000E+02	3.000E+02	1.000E+03
C-14	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12	*4.455E+12
Co-60	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15
Cs-137	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13
Eu-152	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14	*1.765E+14
H-3	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	4.535E+02	4.280E+02	4.469E+02	4.632E+06	*9.597E+15	*9.597E+15
Ni-63	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13
Sr-90	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14

*At specific activity limit

Attachment	1	Sheet No.	22 of 24
Originator:	S. W. Clark	Date	10/11/12
Chk'd By:	M. W. Perrott	Date	10/11/12
Calc. No.	0100D-CA-V0272	Rev. No.	1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  23
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

            Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
            and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
         at tmin = time of minimum single radionuclide soil guideline
      and at tmax = time of maximum total dose =   27.65 ñ 0.06 years
ONuclide  Initial          tmin       DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)
  (i)     (pCi/g)        (years)                  (pCi/g)               (pCi/g)
 ÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄ
 C-14    4.180E+03     0.000E+00      0.000E+00 *4.455E+12  0.000E+00 *4.455E+12
 Co-60   4.550E+00     0.000E+00      1.192E-24 *1.132E+15  4.416E-26 *1.132E+15
 Cs-137  6.060E+01     0.000E+00      0.000E+00 *8.704E+13  0.000E+00 *8.704E+13
 Eu-152  9.660E+00     0.000E+00      6.126E-27 *1.765E+14  2.107E-27 *1.765E+14
 H-3     4.640E+00    27.65 ñ 0.06    3.505E-02  4.279E+02  3.505E-02  4.279E+02
 Ni-63   3.940E+01     0.000E+00      0.000E+00 *5.917E+13  0.000E+00 *5.917E+13
 Sr-90   7.950E+01     0.000E+00      0.000E+00 *1.365E+14  0.000E+00 *1.365E+14
 ||||||| |||||||||  ||||||||||||||||  |||||||||  |||||||||  |||||||||  |||||||||
 *At specific activity limit
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Attachment 1 Sheet No. 23 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  24
 Summary : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	2.700E+01	2.762E+01	2.800E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Co-60	Co-60	1.000E+00	5.423E-24	4.814E-24	3.793E-24	1.647E-24	2.171E-25	2.016E-25	1.927E-25	3.611E-29	0.000E+00	0.000E+00
0Cs-137	Cs-137	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Eu-152	Eu-152	7.208E-01	4.266E-26	4.104E-26	3.799E-26	2.900E-26	1.504E-26	1.469E-26	1.447E-26	8.984E-28	0.000E+00	0.000E+00
Eu-152	Eu-152	2.792E-01	1.652E-26	1.590E-26	1.472E-26	1.123E-26	5.827E-27	5.689E-27	5.606E-27	3.480E-28	0.000E+00	0.000E+00
Eu-152	äDOSE(j)		5.918E-26	5.694E-26	5.271E-26	4.023E-26	2.087E-26	2.038E-26	2.008E-26	1.246E-27	0.000E+00	0.000E+00
0Gd-152	Eu-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.535E-01	1.626E-01	1.557E-01	1.503E-05	1.053E-16	0.000E+00
0Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0Sr-90	Sr-90	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	2.700E+01	2.762E+01	2.800E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	4.180E+03	4.179E+03	4.178E+03	4.173E+03	4.161E+03	4.161E+03	4.161E+03	4.112E+03	3.978E+03	3.545E+03
0Co-60	Co-60	1.000E+00	4.550E+00	3.989E+00	3.065E+00	1.219E+00	1.300E-01	1.198E-01	1.140E-01	8.697E-06	3.177E-17	0.000E+00
0Cs-137	Cs-137	1.000E+00	6.060E+01	5.921E+01	5.651E+01	4.801E+01	3.232E+01	3.186E+01	3.158E+01	5.908E+00	5.616E-02	4.701E-09
0Eu-152	Eu-152	7.208E-01	6.963E+00	6.610E+00	5.956E+00	4.138E+00	1.708E+00	1.654E+00	1.622E+00	3.825E-02	1.154E-06	1.741E-22
Eu-152	Eu-152	2.792E-01	2.697E+00	2.560E+00	2.307E+00	1.603E+00	6.617E-01	6.407E-01	6.281E-01	1.481E-02	4.470E-07	6.745E-23
Eu-152	äS(j):		9.660E+00	9.170E+00	8.264E+00	5.741E+00	2.370E+00	2.295E+00	2.250E+00	5.306E-02	1.601E-06	2.416E-22
0Gd-152	Eu-152	2.792E-01	0.000E+00	1.687E-14	4.808E-14	1.349E-13	2.510E-13	2.536E-13	2.551E-13	3.305E-13	3.316E-13	3.292E-13
0H-3	H-3	1.000E+00	4.640E+00	4.080E+00	3.156E+00	1.284E+00	1.444E-01	1.334E-01	1.270E-01	1.218E-05	8.393E-17	0.000E+00
0Ni-63	Ni-63	1.000E+00	3.940E+01	3.911E+01	3.852E+01	3.655E+01	3.217E+01	3.202E+01	3.193E+01	1.859E+01	4.139E+00	2.155E-02
0Sr-90	Sr-90	1.000E+00	7.950E+01	7.760E+01	7.394E+01	6.244E+01	4.142E+01	4.080E+01	4.043E+01	7.103E+00	5.671E-02	2.578E-09

THF(i) is the thread fraction of the parent nuclide.
0RESCALC.EXE execution time = 1.06 seconds

Attachment 1 Sheet No. 24 of 24
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   1
 Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

                    Table of Contents
        100-D-50:1 Service Area 1 Deep Zone Radionuclides
           Part IV: Concentration of Radionuclides
           ||||||||||||||||||||||||||||||||||||||||||

 Concentration of radionuclides in different media
      Time= 0.000E+00 ..................................   2
      Time= 1.000E+00 ..................................   3
      Time= 3.000E+00 ..................................   4
      Time= 1.000E+01 ..................................   5
      Time= 2.700E+01 ..................................   6
      Time= 2.762E+01 ..................................   7
      Time= 2.800E+01 ..................................   8
      Time= 1.000E+02 ..................................   9
      Time= 3.000E+02 ..................................  10
      Time= 1.000E+03 ..................................  11
```

Attachment 2 Sheet No. 1 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page   2
 Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
```

Concentration of radionuclides in environmental media
at t = 0.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.180E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	4.550E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	6.060E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	9.660E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	4.640E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	3.940E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	7.950E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 0.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 2 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

```
1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   3
 Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 1.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.179E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	3.989E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	5.921E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	9.170E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	1.687E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	4.080E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	3.911E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	7.760E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 3 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   4
Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 3.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.178E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	3.065E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	5.651E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	8.264E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	4.808E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	3.156E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	3.852E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	7.394E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 3.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 4 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page   5
 Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 1.000E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.173E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	1.219E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	4.801E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	5.741E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	1.349E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.284E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	3.655E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	6.244E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 5 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 10/09/2012 13:00 Page 6
Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Concentration of radionuclides in environmental media
at t = 2.700E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.161E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	1.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	3.232E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	2.370E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	2.510E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.444E-01	0.000E+00	0.000E+00	2.517E+03	8.344E+00
Ni-63	3.217E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	4.142E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 2.700E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	2.516E+03	9.420E+03	1.389E+04	4.360E+03	4.385E+03	2.414E+03	2.775E+03	8.318E+00	8.318E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
for livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 6 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T½ Limit = 180 days        10/09/2012  13:00  Page   7
Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 2.762E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.161E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	1.198E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	3.186E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	2.295E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	2.536E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.334E-01	0.000E+00	0.000E+00	2.667E+03	8.840E+00
Ni-63	3.202E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	4.080E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 2.762E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	2.666E+03	9.989E+03	1.472E+04	4.637E+03	4.658E+03	2.565E+03	2.943E+03	8.816E+00	8.816E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 7 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page   8
Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 2.800E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.161E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	1.140E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	3.158E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	2.250E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	2.551E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.270E-01	0.000E+00	0.000E+00	2.547E+03	8.444E+00
Ni-63	3.193E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	4.043E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 2.800E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	2.548E+03	9.625E+03	1.408E+04	4.604E+03	4.574E+03	2.527E+03	2.843E+03	8.456E+00	8.456E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 8 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 10/09/2012 13:00 Page 9
Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	4.112E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	8.697E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	5.908E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	5.306E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	3.305E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.218E-05	0.000E+00	0.000E+00	2.458E-01	8.147E-04
Ni-63	1.859E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	7.103E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.
Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	2.458E-01	9.286E-01	1.358E+00	4.442E-01	4.413E-01	2.439E-01	2.743E-01	8.158E-04	8.158E-04
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 9 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  10
 Concent : 100-D-50:1 RESRAD Evaluation for Rev. 1 of Calc. No. 0100D-CA-V0272
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 3.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	3.978E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	3.177E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	5.616E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	1.601E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	3.316E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	8.393E-17	0.000E+00	0.000E+00	1.723E-12	5.710E-15
Ni-63	4.139E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	5.671E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 3.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	1.723E-12	6.509E-12	9.519E-12	3.114E-12	3.093E-12	1.709E-12	1.923E-12	5.718E-15	5.718E-15
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 10 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        10/09/2012  13:00  Page  11
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 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\100-D-50-1_0100D-CA-V0272_REV1.RAD
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Concentration of radionuclides in environmental media
at t = 1.000E+03 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
C-14	3.545E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	4.701E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	2.416E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	3.292E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	2.155E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	2.578E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of H-3 in soil moisture = 0.000E+00 pCi/ml
Concentration of gaseous H-3 in air = 0.000E+00 pCi/m**3
Concentration of gaseous C-14 in air = 0.000E+00 pCi/m**3

Concentration of radionuclides in foodstuff media
at t = 1.000E+03 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
C-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 11 of 11
Originator: S. W. Clark Date 10/11/12
Chk'd By: M. W. Perrott Date 10/11/12
Calc. No. 0100D-CA-V0272 Rev. No. 1

APPENDIX C

100-D-50:1 INFORMATIONAL SAMPLES COLLECTED NEAR FORMER 100-D-8 OUTFALL

Table C-1. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Radionuclide Analyses.

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
Pipeline Sediment	J1R3M5	10/16/2012	0.287	U	0.287	0.366	U	0.854	2.86		0.03	0.191		0.019	1.95		0.064
Soil under pipe	J1R3M6	10/16/2012	0.36	U	0.36	0.879		0.815	0.078	U	0.078	0.075	U	0.075	0.22	U	0.22

Location	HEIS Number	Sample Date	Europium-154			Europium-155			Nickel-63			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Pipeline Sediment	J1R3M5	10/16/2012	0.791		0.064	0.083	U	0.083	7.48		2.95	11.4		0.155	0.405		0.047
Soil under pipe	J1R3M6	10/16/2012	0.258	U	0.258	0.225	U	0.225	0.084	U	3.02	7.96		0.735	0.437		0.136

Location	HEIS Number	Sample Date	Radium-228			Silver-108m			Total beta radiostrontium			Thorium-228			Thorium-232		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Pipeline Sediment	J1R3M5	10/16/2012	0.58		0.09				0.055	U	0.238	0.581		0.035	0.58		0.09
Soil under pipe	J1R3M6	10/16/2012	0.408		0.32	0.061	U	0.061	0.05	U	0.279	0.516		0.126	0.408		0.32

Location	HEIS Number	Sample Date	Tritium			Uranium-235 (GEA)			Uranium-238 (GEA)			Uranium-233/234 (Iso-U)			Uranium-235 (Iso-U)		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Pipeline Sediment	J1R3M5	10/16/2012	0.546	U	3.92	0.148	U	0.148	2.79	U	2.79	0.523		0.211	0	U	0.255
Soil under pipe	J1R3M6	10/16/2012	1.97	U	3.42	0.448	U	0.448	10.7	U	10.7	0.645		0.247	0.039	U	0.299

Location	HEIS Number	Sample Date	Uranium-238 (Iso-U)		
			pCi/g	Q	MDA
Pipeline Sediment	J1R3M5	10/16/2012	0.468		0.211
Soil under pipe	J1R3M6	10/16/2012	0.548		0.247

HEIS = Hanford Environmental Information System
MDA = minimum detectable activity

Table C-2. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Inorganic Analyses. (2 Pages)

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
Pipeline Sediment	J1R3M5	10/16/2012	10400		4.81	0.577	U	0.577	5.53		0.962	102		0.481	0.354		0.192
Soil under pipe	J1R3M6	10/16/2012	6600		4.52	0.543	U	0.543	1.46		0.904	70.1		0.452	0.238		0.181

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
Pipeline Sediment	J1R3M5	10/16/2012	2.89		1.92	1.23		0.192	11800		96.2	67.8		0.192	9.75		1.92
Soil under pipe	J1R3M6	10/16/2012	0.81	B	1.81	0.081	B	0.181	7180		90.4	6.93		0.181	8.37		1.81

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
Pipeline Sediment	J1R3M5	10/16/2012	85		0.962				34900		19.2	40.1		0.481	6700		72.1
Soil under pipe	J1R3M6	10/16/2012	15.2		0.904	0.21	U	0.21	30300		18.1	2.57		0.452	5420		67.8
Pipeline Sediment	J1R3M4	10/16/2012				2.37		0.155									

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
Pipeline Sediment	J1R3M5	10/16/2012	507		4.81	4.66		0.281	1.01	B	1.92	16		3.85	1850		385
Soil under pipe	J1R3M6	10/16/2012	372		4.52	0.0265	U	0.0265	0.515	B	1.81	8.83		3.62	862		362

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
Pipeline Sediment	J1R3M5	10/16/2012	0.962	U	0.962	710		1.92	0.192	U	0.192	679		48.1	86.9		2.4
Soil under pipe	J1R3M6	10/16/2012	0.271	U	0.271	349		1.81	0.181	U	0.181	447		45.2	92.2		2.26

Table C-2. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Inorganic Analyses. (2 Pages)

Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
Pipeline Sediment	J1R3M5	10/16/2012	160		9.62
Soil under pipe	J1R3M6	10/16/2012	52.1		9.04

HEIS = Hanford Environmental Information System
PQL = practical quantitation limit

Table C-3. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Anions.

Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Pipeline Sediment	J1R3M5	10/16/2012	1	U	1	7.5		1	1	U	1	16.8		1	1.5	B	1
Soil under pipe	J1R3M6	10/16/2012	1	U	1	1	U	1	1	U	1	1.2	B	1	1	U	1

Location	HEIS Number	Sample Date	Nitrogen in Nitrite and Nitrate			Phosphate			Sulfate			Percent Solids			pH Measurement		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	%	Q	PQL	pH	Q	PQL
Pipeline Sediment	J1R3M5	10/16/2012	4.12		0.1	10.3		2	51.3		1				8.83		0.1
Soil under pipe	J1R3M6	10/16/2012	0.22	B	0.1	2	U	2	3.6	B	1	97		0.1	8.9		0.1

HEIS = Hanford Environmental Information System
PQL = practical quantitation limit

Table C-4. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Organic Analyses. (3 Pages)

Constituent	Pipeline Sediment - J1R3M5			Soil Under pipe - J1R3M6		
	10/16/2012			10/16/2012		
	ug/kg	Q	PQL	ug/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons (EPA Method 8310)						
Acenaphthene	79	UD	79	3.4	U	3.4
Acenaphthylene	79	UD	79	3.4	U	3.4
Anthracene	125	D	79	4.31		3.4
Benzo(a)anthracene	1,770	D	79	48.7		3.4
Benzo(a)pyrene	2,500	D	79	50		3.4
Benzo(b)fluoranthene	1670	D	79	27.5		3.4
Benzo(ghi)perylene	1910	D	79	48.9		3.4
Benzo(k)fluoranthene	1010	D	79	19.9		3.4
Chrysene	1950	D	79	41.4		3.4
Dibenz[a,h]anthracene	186	D	79	3.63		3.4
Fluoranthene	2100	D	79	77.1		3.4
Fluorene	79	UD	79	3.4	U	3.4
Indeno(1,2,3-cd)pyrene	932	D	79	22.4		3.4
Naphthalene	1540	D	79	25.5		3.4
Phenanthrene	598	D	79	19.7		3.4
Pyrene	2620	D	79	68.5		3.4
Polychlorinated Biphenyls						
Aroclor-1016	13.3	U	13.3	13.5	U	13.5
Aroclor-1221	13.3	U	13.3	13.5	U	13.5
Aroclor-1232	13.3	U	13.3	13.5	U	13.5
Aroclor-1242	13.3	U	13.3	13.5	U	13.5
Aroclor-1248	13.3	U	13.3	13.5	U	13.5
Aroclor-1254	22.7		13.3	13.5	U	13.5
Aroclor-1260	65.3		13.3	13.5	U	13.5
Aroclor-1262	13.3	U	13.3	13.5	U	13.5
Aroclor-1268	13.3	U	13.3	13.5	U	13.5
Pesticides						
Aldrin	1.33	UD	1.33	1.35	UD	1.35
Alpha-BHC	1.33	UD	1.33	1.35	UD	1.35
alpha-Chlordane	1.33	UD	1.33	1.35	UD	1.35
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.33	UD	1.33	1.35	UD	1.35
Delta-BHC	1.33	UD	1.33	1.35	UD	1.35
Dichlorodiphenyldichloroethane	1.56	J D	1.33	1.35	UD	1.35
Dichlorodiphenyldichloroethylene	1.76	J D	1.33	1.35	UD	1.35
Dichlorodiphenyltrichloroethane	22.7	D	1.33	1.35	UD	1.35
Dieldrin	1.33	UD	1.33	1.35	UD	1.35

Table C-4. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Organic Analyses. (3 Pages)

Constituent	Pipeline Sediment - J1R3M5			Soil Under Pipe - J1R3M6		
	10/16/2012			10/16/2012		
	ug/kg	Q	PQL	ug/kg	Q	PQL
Pesticides						
Endosulfan I	1.33	UD	1.33	1.35	UD	1.35
Endosulfan II	1.33	UD	1.33	1.35	UD	1.35
Endosulfan sulfate	1.33	UD	1.33	1.35	UD	1.35
Endrin	1.33	UD	1.33	1.35	UD	1.35
Endrin aldehyde	1.56	J D	1.33	1.35	UD	1.35
Endrin ketone	1.33	UD	1.33	1.35	UD	1.35
Gamma-BHC (Lindane)	1.33	UD	1.33	1.35	UD	1.35
gamma-Chlordane	1.33	UD	1.33	1.35	UD	1.35
Heptachlor	1.33	UD	1.33	1.35	UD	1.35
Heptachlor epoxide	1.33	UD	1.33	1.35	UD	1.35
Methoxychlor	1.33	UD	1.33	1.35	UD	1.35
Toxaphene	19.9	UD	19.9	20.3	UD	20.3
Semivolatile Organic Analysis (EPA Method 8270)						
1,2,4-Trichlorobenzene	6420	UD	6420	340	U	340
1,2-Dichlorobenzene	6420	UD	6420	340	U	340
1,3-Dichlorobenzene	6420	UD	6420	340	U	340
1,4-Dichlorobenzene	6420	UD	6420	340	U	340
2,4,5-Trichlorophenol	6420	UD	6420	340	U	340
2,4,6-Trichlorophenol	6420	UD	6420	340	U	340
2,4-Dichlorophenol	6420	UD	6420	340	U	340
2,4-Dimethylphenol	6420	UD	6420	340	U	340
2,4-Dinitrophenol	32100	UD	32100	1700	U	1700
2,4-Dinitrotoluene	6420	UD	6420	340	U	340
2,6-Dinitrotoluene	6420	UD	6420	340	U	340
2-Chloronaphthalene	6420	UD	6420	340	U	340
2-Chlorophenol	6420	UD	6420	340	U	340
2-Methylnaphthalene	6420	UD	6420	340	U	340
2-Methylphenol (cresol, o-)	6420	UD	6420	340	U	340
2-Nitroaniline	32100	UD	32100	1700	U	1700
2-Nitrophenol	6420	UD	6420	340	U	340
3+4 Methylphenol (cresol, m+p)	6420	UD	6420	340	U	340
3,3'-Dichlorobenzidine	12800	UD	12800	680	U	680
3-Nitroaniline	32100	UD	32100	1700	U	1700
4,6-Dinitro-2-methylphenol	6420	UD	6420	340	U	340
4-Bromophenylphenyl ether	6420	UD	6420	340	U	340
4-Chlorophenylphenyl ether	6420	UD	6420	340	U	340
4-Nitroaniline	32100	UD	32100	1700	U	1700
4-Nitrophenol	32100	UD	32100	1700	U	1700

Table C-4. 100-D-50:1 Pipeline Informational Samples Near Former 100-D-8 Outfall - Organic Analyses. (3 Pages)

Constituent	Pipeline Sediment - J1R3M5			Soil Under Pipe - J1R3M6		
	10/16/2012			10/16/2012		
	ug/kg	Q	PQL	ug/kg	Q	PQL
Semivolatile Organic Analysis (EPA Method 8270)						
Acenaphthene	6420	UD	6420	340	U	340
Acenaphthylene	6420	UD	6420	340	U	340
Anthracene	6420	UD	6420	340	U	340
Benzo(a)anthracene	6420	UD	6420	340	U	340
Benzo(a)pyrene	6420	UD	6420	340	U	340
Benzo(b)fluoranthene	6420	UD	6420	340	U	340
Benzo(ghi)perylene	6420	UD	6420	340	U	340
Benzo(k)fluoranthene	6420	UD	6420	340	U	340
Bis(2-chloro-1-methylethyl)ether	6420	UD	6420	340	U	340
Bis(2-Chloroethoxy)methane	6420	UD	6420	340	U	340
Bis(2-chloroethyl) ether	6420	UD	6420	340	U	340
Bis(2-ethylhexyl) phthalate	6420	UD	6420	340	U	340
Butylbenzylphthalate	6420	UD	6420	340	U	340
Carbazole	6420	UD	6420	340	U	340
Chrysene	6420	UD	6420	340	U	340
Di-n-butylphthalate	6420	UD	6420	340	U	340
Di-n-octylphthalate	6420	UD	6420	340	U	340
Dibenz[a,h]anthracene	6420	UD	6420	340	U	340
Dibenzofuran	6420	UD	6420	340	U	340
Diethyl phthalate	6420	UD	6420	340	U	340
Dimethyl phthalate	6420	UD	6420	340	U	340
Fluoranthene	1140	JD	6420	340	U	340
Fluorene	6420	UD	6420	340	U	340
Hexachlorobenzene	6420	UD	6420	340	U	340
Hexachlorobutadiene	6420	UD	6420	340	U	340
Hexachlorocyclopentadiene	6420	UD	6420	340	U	340
Hexachloroethane	6420	UD	6420	340	U	340
Indeno(1,2,3-cd)pyrene	6420	UD	6420	340	U	340
Isophorone	6420	UD	6420	340	U	340
N-Nitroso-di-n-dipropylamine	6420	UD	6420	340	U	340
N-Nitrosodiphenylamine	6420	UD	6420	340	U	340
Naphthalene	6420	UD	6420	340	U	340
Nitrobenzene	6420	UD	6420	340	U	340
Pentachlorophenol	32100	UD	32100	1700	U	1700
Phenanthrene	6420	UD	6420	340	U	340
Phenol	6420	UD	6420	340	U	340
Pyrene	6420	UD	6420	340	U	340

HEIS = Hanford Environmental Information System
PQL = practical quantitation limit

APPENDIX D

DATA QUALITY ASSESSMENT

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DATA QUALITY ASSESSMENT

CONFIRMATORY SAMPLING

A data quality assessment (DQA) review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified in the confirmatory sampling work instruction (WCH 2005a). This review involves evaluation of the data to determine if it is of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data process (EPA 2006).

This DQA review was performed in accordance with the site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009). This DQA included a review of the work instruction (WCH 2005a) and the field logbooks (WCH 2005b, 2005c, 2006a, 2006b). All samples were collected per the sample design with the exception of a planned sample at manhole T-2 (test pit 5), which was cancelled with regulator concurrence for safety reasons stemming from active electrical utility features at the location of the proposed excavation. To ensure quality data sets, the SAP data assurance requirements, as well as the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) were followed, where appropriate.

The sample design (WCH 2005a) lists inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), chlorinated pesticides, isotopic uranium, tritium, nickel-63, carbon-14, technetium-99, gross alpha, gross beta, and gamma spectroscopy as analytical methods for the confirmatory sampling of the 100-D-50:1 subsite. Additionally, radiostrontium analysis was performed for two samples (J10VF6 and J10VD6) from which gross beta activity was detected above background levels. Due to a miscommunication with the analytical laboratory, chlorinated herbicide analysis was inadvertently performed on the pipe sediment samples. The confirmatory data for the 100-D-50:1 subsite were generated in five sample delivery groups (SDGs): SDG J00035, SDG J00042, SDG K0154, SDG K0155, and SDG K0168. Third-party validation was performed on SDG J00042 and SDG K0168. Major deficiencies were found. Minor deficiencies identified will be included in the SDG specific discussions below.

SDG J00035

SDG J00035 consists of three field samples (J10VF7, J10VF8, and J10VH0) and one field duplicate (J10VF9, associated with primary sample J10VF8) analyzed for hexavalent chromium. The hexavalent chromium matrix spike (MS) was not recovered. A lead chromate spike had a 67% recovery, the laboratory control sample (LCS) recovery was 104%, and the post-digestion spike was within acceptance criteria. Due to the complete loss of the initial MS, the data are not acceptable for decision-making purposes. The project has rejected the hexavalent chromium results for all samples in SDG J00035 and qualified the data with "R" flags. Additional pipe

sediment samples were collected from test pit 4 and analyzed for hexavalent chromium in SDG J00070.

SDG J00042

SDG J00042 consists of field sample J10VH2, analyzed for hexavalent chromium and submitted for third-party validation. The MS/matrix spike duplicate (MSD) recoveries were each 35%. Accordingly, hexavalent chromium results in SDG J00042 were qualified as estimated and flagged with a "J" by third-party validation. The LCS had an acceptable recovery at 103%, all of the samples met the required detection limit (RDL), and the duplicate results were within the acceptance criteria. The lowered recovery in the MS/MSD and the absence of detectable hexavalent chromium in the field sample is indicative of a sample matrix that is reactive (reducing) to hexavalent chromium. The data remain usable for decision-making purposes.

SDG J00070

SDG J00070 consists of field sample J11WP4, its associated field duplicate (J11WP5), and a field equipment blank sample (J11WP3), all analyzed for hexavalent chromium. These samples were collected after the samples of SDG J00035 were determined to be unusable for decision-making purposes. There were no data quality issues within SDG J00070.

SDG K0154

SDG K0154 consists of field samples J10VD6, J10VD8, J10VD9, and J10VF0 and a field equipment blank (J10VD7). Radiological analysis of SDG K0154 was conducted for gross alpha, gross beta, tritium, carbon-14, nickel-63, technetium-99, isotopic uranium, and by gamma spectroscopy. Because the gross beta in sample J10VD6 was 155 pCi/g the sample was also analyzed for total radiostrontium. Chemical analysis was conducted for PCBs, SVOCs, hexavalent chromium, pesticides, ICP metals, and mercury.

In the radiochemical analysis, the gross alpha LCS result was below acceptance criteria. There were no other issues with the radiochemical analyses, and all data remain usable for decision-making purposes.

There were no issues in the PCB or hexavalent chromium analyses.

In the SVOC analysis, 1 of the 54 surrogates recoveries was outside acceptance criteria. However, the alternate surrogate recovery criteria were met (no more than one surrogate outlier per fraction, all above 10%). The analytes di-n-butylphthalate and bis(2-ethylhexyl)phthalate had MS recoveries out of criteria at 51% and 46%, respectively, and were found in the method blank (MB) at less than two times the RDL. The analytes 1,2-dichlorobenzene, 4-chloroaniline, 4-nitrophenol, pentachlorophenol, phenanthrene, and fluoranthene had MSD recoveries out of criteria at 48%, 125%, 156%, 132%, 153%, and 133%, respectively. All data remain usable for decision-making purposes.

In the ICP metals and mercury analyses, sodium was above the practical quantitation limit (PQL) in the MB. The LCS for silicon was outside of acceptance criteria at 51.7%. Matrix spike recoveries were outside acceptance criteria for aluminum (646.5%), iron (2,062%), manganese (100.8%), and silicon (166.0%). Post-digestion spikes (PDSs) and serial dilutions were run and were within criteria, with the exception of iron (64.1%). All relative percent differences (RPDs) were within control limits. Arsenic, calcium, copper, manganese, and sodium were detected in the MB at concentrations below their respective RDLs. All data remain usable for decision-making purposes.

Sample extracts in the pesticide analysis required a four-fold dilution due the nature of the sample matrix. All data remain usable for decision-making purposes.

SDG K0155

SDG K0155 consists of three field samples (J10VF1, J10VF2, and J10VF4) and one field duplicate (J10VF3, associated with primary sample J10VF2). Radiological analysis of SDG K0155 was conducted for gross alpha, gross beta, tritium, carbon-14, nickel-63, technetium-99, isotopic uranium, and by gamma spectroscopy. Chemical analysis was conducted for PCBs, SVOCs, hexavalent chromium, pesticides, herbicides, ICP metals, and mercury.

There were no issues in the radiological analyses.

There were no issues in the PCB or hexavalent chromium analyses.

The SVOC analysis required dilutions of 5 to 100 times due to the thick, black consistency of the sample extracts, resulting in PQLs significantly above RDLs. Twenty of the 123 obtainable MS/MSD recoveries were outside of acceptance criteria. All of these occurrences are attributable to the significant concentrations of polyaromatic hydrocarbons detected in the samples. Quantitation of detected analytes may be considered estimated due to the significant dilution required. The common laboratory contaminants bis(2-ethylhexyl)phthalate and di-n-butylphthalate were also found in the MB at concentrations below RDLs. The data are usable for decision-making purposes.

In the pesticide analysis, the analytes alpha-BHC, gamma-BHC, endosulfan I, and 4,4'-DDE had high MS/MSD recoveries at 139%/134%, 135%/133%, 131%/127%, and 130%/128%, respectively. The analyte aldrin had a high MS recovery at 122%. These results suggest a high bias in the resulting data. The sample extracts were diluted four- fold due to the nature of the extract, which is typical for Method 8081A. In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The analytical laboratory typically quantitates toxaphene, but does not include it within the quality assurance (QA)/quality control (QC) samples. Toxaphene is a mixture of compounds rather than a discrete analyte; while the overall concentration of toxaphene can be calculated using several unobstructed peaks in the chromatography, the inclusion of toxaphene in the spiking mixture would be problematic for the other target analytes. The data are usable for decision-making purposes.

Sample extracts in the herbicide analysis required 5- to 10-fold dilutions because of the nature of the extracts. The surrogate 2,4-dichlorophenylacetic acid was recovered above the acceptance criteria at 162% in sample J10VF1. The high surrogate suggests a high bias in sample J10VF1; however, none of the target analytes were detected in that sample and there is no affect on the usability of the data. The analyte dichloroprop was recovered at 168% in the MS. This also suggests a high bias in the data for this analyte.

In the ICP metals analysis, the samples required six-fold dilutions due to the nature of the sample matrix and high concentrations of target analytes. The LCS for silicon was below acceptance criteria at 51.7%. The RPDs for 14 analytes were above criteria (aluminum 63%, arsenic 52%, boron 38.3%, barium 48.7%, cobalt 42.0%, chromium 38.5%, potassium 62.7%, manganese 33.1%, sodium 40.1%, nickel 41.3%, lead 93.0%, antimony 43.7%, vanadium 56.0%, and zinc 63.8%). Elevated RPDs are a common problem in soil samples. It is probable that the main and duplicate samples did not have equivalent amounts of essentially inert material, such as rock. Arsenic, calcium, copper, manganese, and sodium were detected in the MB at concentrations below their respective RDLs. The data are usable for decision-making purposes.

SDG K0168

This SDG consists of field sample J10VF6. Radiological analysis of SDG K0155 included gross alpha, gross beta, tritium, carbon-14, nickel-63, technetium-99, isotopic uranium, and analysis by gamma spectroscopy. Chemical analysis for PCBs, SVOCs, pesticides, ICP metals, and mercury was performed.

In the radiological analyses, some gamma spectroscopy minimum detectable activities were above the contracted detection activities, but well below the applicable remedial action goal values. Third-party validation qualified the tritium, carbon-14, and nickel-63 results as estimates with "J" flags due to a lack of MS analysis for those analytes. The analytical methods used for these analytes are not compatible with spiking, but the methodology used is more robust than other methods in ensuring that the maximum amounts of the target analytes are released from the sample matrix. All data are usable for decision-making purposes.

There are no issues in the PCB analysis.

In the SVOC analysis, the MS recovery for methylnaphthalene was above acceptance criteria at 101%, and the LCS recovery for hexachlorocyclopentadiene was above acceptance criteria at 103%. The common laboratory contaminant bis(2-ethylhexyl)phthalate was found in the MB at a concentration below the RDL. The data are usable for decision-making purposes.

In the pesticide analysis, the sample extracts were diluted four-fold due to the nature of the extract, which is typical for Method 8081A. Toxaphene was not included in the MS, MSD, or LCS samples, which is typical for the analytical laboratory due to the nature of toxaphene. The data are usable for decision-making purposes.

In the ICP metals analysis, third-party validation qualified magnesium and antimony results as estimated with a "J" flag due to MS recoveries outside of acceptance criteria (-153% and -58%, respectively). Silicon results were also qualified as estimates due to an LCS recovery (-53%) outside of acceptance criteria. Due to RPD values outside of acceptance criteria, all chromium (91%), copper (41%), iron (46%), mercury (54%), nickel (50%), lead (190%), silicon (35%), and zinc (39%) results were qualified as estimates and assigned "J" flags. As discussed above, elevated RPDs are attributed to natural heterogeneities in the soil samples. Calcium, silicon, and sodium were detected in the MB at concentrations below their respective RDLs. There were no other issues in the ICP metals or mercury analyses, and the data remain usable for decision-making purposes.

Summary

Limited, random or sample matrix-specific influenced batch QC issues such as these are a potential for any analysis. The number and types seen in these data sets were within expectations for the matrix types and analyses performed.

The DQA review for the 100-D-50:1 subsite concludes that the rejected hexavalent chromium data of SDG J00035 leave the 100-D-50:1 data set deficient with respect to the samples planned for in the work instruction. Samples were collected (SDG J00070) to replace the rejected samples in SDG J00035. The resulting data set remains deficient with respect to the work instruction but has been determined to be sufficient to support decision-making purposes.

With the exception of the SDG J00035 hexavalent chromium data, the DQA review for the 100-D-50:1 subsite data set found the results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The DQA review for the 100-D-50:1 subsite concludes that the accepted data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of quality assurance and quality control deficiencies. All analytical data were found acceptable for decision-making purposes. The confirmatory sample analytical data are stored in the Environmental Restoration (ENRE) project-specific database prior to submitting to the Hanford Environmental Information System (HEIS) and are included as Attachment 2 of the *100-D-50:1 Subsite Cleanup Verification 95% UCL Calculations* in Appendix B.

VERIFICATION SAMPLING

A DQA was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2012b). This DQA was performed in accordance with site specific data quality objectives found in the SAP (DOE-RL 2009).

A review of the sample design (WCH 2012b), the field logbook (WCH 2012a), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design. To ensure quality data, the SAP data assurance

requirements and the data validation procedures for chemical analysis and radiochemical analysis (BHI 2000a, 2000b) are used, as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification sample data collected at the 100-D-50:1 waste site were provided by the laboratories in five SDGs: SDG KP0126, SDG KP0128, SDG KP0129, SDG KP0130, and SDG K3983. SDG KP0128 was submitted for third-party validation. Major deficiencies were identified in this analytical data set and are discussed below. Minor deficiencies for the 100-D-50:1 verification data set are discussed by SDG as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

Major Deficiencies

In the ion chromatograph (IC) anions analysis, the holding times for nitrate, nitrite, and orthophosphate in Method 300.0 were exceeded by more than twice the limit for SDG KP0126, SDG KP0128, SDG KP0129, SDG KP0130, and SDG K3983. Third-party validation or the project qualified all undetected nitrate, nitrite, and orthophosphate results in these SDGs as rejected with "UR" flags.

These results were anticipated by the project. To obtain usable nitrate and nitrite data, Method 353.2 was also run, which has longer allowable holding time. These data effectively replace the rejected Method 300.0 nitrate and nitrite data. Orthophosphate is not a regulated compound. Therefore, the resulting data set is sufficient for decision-making purposes.

Minor Deficiencies

SDG KP0128

This SDG comprises 13 statistical soil samples (J1R0T2 through J1R0T9, J1R0V0 through J1R0V5) collected from the 100-D-50:1 waste site excavation area. This SDG includes the main sample of a field duplicate pair (J1R0V0/J1R0V5). These samples were analyzed for gamma energy analysis (GEA), strontium-90, nickel-63, carbon-14, isotopic uranium, ICP metals, mercury, hexavalent chromium, IC anions, nitrate, nitrite, semivolatile organic analysis (SVOA), PCBs, and pesticides. SDG KP0128 was submitted for third-party validation. Minor deficiencies are as follows:

In the Method 300 anions analysis, holding times were exceeded by more than twice the accepted limit for nitrate, nitrite, and orthophosphate. Nondetected results for these analytes are discussed above in the major deficiencies section. Third-party validation qualified all of the detected Method 300 nitrate, nitrite, and orthophosphate results as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the pH analysis, holding times were exceeded by more than twice the accepted limit. Third-party validation qualified all pH results in SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, MS recoveries for antimony (34.7%) and calcium (143%) are outside the QC limits. Third-party validation qualified all antimony and calcium results in SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for aluminum (142%) is outside the QC limits. Third-party validation qualified all aluminum results in SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. Toxaphene is actually a mixture of compounds rather than a discrete analyte. While the overall concentration of toxaphene can be calculated using several unobstructed peaks in the chromatography, the inclusion of toxaphene in the spiking mixture would be problematic for the other pesticide analytes. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. Third-party validation qualified the toxaphene results as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the isotopic uranium analysis, no LCS was performed for uranium-235. Third-party validation qualified all uranium-235 results for SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the tritium and carbon-14 analyses, no MSs were performed. Third-party validation qualified all tritium and carbon-14 results in SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS and the MSD recoveries for 2,4-dinitrophenol (36%, 37%) are outside the QC limits. Third-party validation qualified all 2,4-dinitrophenol results in SDG KP0128 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG KP0126

This SDG is comprised of 13 statistical soil samples (J1R0V6 through J1R0V9, J1R0W0 through J1R0V8) collected from the 100-D-50:1 waste site staging pile area (SPA). This SDG includes one field duplicate pair (J1R0W2/J1R0W8). These samples were analyzed for GEA, strontium-90, nickel-63, carbon-14, isotopic uranium, ICP metals, mercury, hexavalent chromium, IC anions, nitrate, nitrite, SVOA, PCBs, and pesticides. Minor deficiencies are as follows:

In the isotopic uranium analysis, the RPD calculated for uranium-233/234 (36%) is outside the QC limit. Uranium-233/234 results for SDG KP0126 may be considered estimated. Estimated data are usable for decision-making purposes.

In the isotopic uranium analysis, no LCS was performed for uranium-235. All uranium-235 results for SDG KP0126 may be considered estimated. Estimated data are usable for decision-making purposes.

In the tritium and carbon-14 analyses, no MSs were performed. All tritium and carbon-14 results in SDG KP0126 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the LCS recovery for 2,4-dinitrophenol (10%) is outside the QC limits. All 2,4-dinitrophenol results in SDG KP0126 may be considered estimated. Estimated data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. All toxaphene results in SDG KP0126 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for aluminum, antimony, calcium, iron, manganese, and silicon are outside the QC limits. Post-digestion spikes were prepared and analyzed by the laboratory with acceptable results in the range of 74.1% to 90.7%. For most of these analytes, the original spiking concentration was small relative to the native concentration in the matrix. Therefore, the initial MS result is more a measure of the natural heterogeneity of the sample matrix than the efficiency of the extraction. The data are usable for decision-making purposes.

In the Method 300 anions analysis, holding times were exceeded by more than twice the accepted limit for nitrate, nitrite, and orthophosphate. Nondetected results for these analytes are discussed above in the Major Deficiencies section. Detected results may be considered estimated. Estimated data are usable for decision-making purposes.

In the pH analysis, holding times were exceeded by more than twice the accepted limit. These results may be considered estimated. Estimated data are usable for decision-making purposes.

SDG KP0129

This SDG comprises 13 statistical soil samples (J1R0W9, J1R0X0 through J1R0X3, J1R0X5 through J1R0X9, J1R100, J1R101) collected from the 100-D-50:1 waste site northern overburden SPA. This SDG includes one field duplicate pair (J1R0X8/J1R101). These samples were analyzed for GEA, strontium-90, nickel-63, carbon-14, isotopic uranium, ICP metals, mercury, hexavalent chromium, IC anions, nitrate, nitrite, SVOA, PCBs, and pesticides. Minor deficiencies are as follows:

In the isotopic uranium analysis, no LCS was performed for uranium-235. All uranium-235 results for SDG KP0129 may be considered estimated. Estimated data are usable for decision-making purposes.

In the tritium and carbon-14 analyses, no MSs were performed. All tritium and carbon-14 results in SDG KP0129 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the surrogate 2,4,6-tribromophenol recovered below the QC limits at 13%. The laboratory evaluation of this deficiency is that the surrogate underwent a chemical reaction and that there is no indication that the analytical system was operating out of control. The data are usable for decision-making purposes.

In the SVOC analysis, the common laboratory contaminant diethyl phthalate was detected in the MB below the method detection limit (MDL). There is no impact on the field sample data. The data are usable for decision-making purposes.

In the SVOC analysis, the RPD calculated between the MS and the MSD for the analytes 2,4-dinitrophenol (49%) and pentachlorophenol (59%) are above the QC limit (30%). Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. The data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. All toxaphene results in SDG KP0129 may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the LCS recoveries for aldrin (69.1%), beta-BHC (70.3%), and endrin aldehyde (27.1%) are below the laboratory QC limits. Quantitation is confirmed for all of these analytes by acceptable MS and MSD results. The data are usable for decision-making purposes.

In the ICP metals analysis, calcium and zinc were detected in the MB. Both detections are less than one-tenth of the MDL. Method blank contamination of this magnitude will have no significant impact on the field sample results. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for aluminum, antimony, iron, and silicon are outside the QC limits. Post-digestion spikes were prepared and analyzed by the laboratory with acceptable results. For most of these analytes the original spiking concentration was small relative to the native concentration in the matrix. Therefore, the initial MS result is more a measure of the natural heterogeneity of the sample matrix than the efficiency of the extraction. The data are usable for decision-making purposes.

In the Method 300 anions analysis, holding times were exceeded by more than twice the accepted limit for nitrate, nitrite, and orthophosphate. Nondetected results for these analytes are discussed above in the Major Deficiencies section. Detected results may be considered estimated. Estimated data are usable for decision-making purposes.

SDG KP0130

This SDG comprises 13 statistical soil samples (J1R102 through J1R109, J1R110 through J1R114) collected from the 100-D-50:1 waste site southern overburden SPA. This SDG includes one field duplicate pair (J1R102/J1R114) and one equipment blank (J1R115). These field samples were analyzed for GEA, strontium-90, nickel-63, carbon-14, isotopic uranium, ICP metals, mercury, hexavalent chromium, IC anions, nitrate, nitrite, SVOA, PCBs, and pesticides. The equipment blank was analyzed for ICP metals, mercury, and SVOA. Minor deficiencies are as follows:

In the isotopic uranium analysis, no LCS was performed for uranium-235. All uranium-235 results for SDG KP0130 may be considered estimated. Estimated data are usable for decision-making purposes.

In the tritium and carbon-14 analyses, no MSs were performed. All tritium and carbon-14 results in SDG KP0130 may be considered estimated. Estimated data are usable for decision-making purposes.

In the uranium-235 analysis, the RPD associated with the laboratory duplicate (55%) is above the QC limits. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. The data are usable for decision-making purposes.

In the SVOA, LCS recoveries for 2,4-dinitrophenol (6%) and 4,6-dinitro-2-methylphenol (18%) are below the QC limits. Acidic phenols, such as these, can cause erratic chromatography. Quantitation for these two analytes is confirmed by acceptable results for the MS and the MSD. Results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol may be considered estimated. Estimated data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. All toxaphene results in SDG KP0130 may be considered estimated. Estimated data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the LCS recoveries for half of the analytes are marginally below the QC limits. The surrogate recoveries also appear to be lower than expected, but still within the QC range. The laboratory concluded that losses during the extraction account for these results. The deficiency is limited to the LCS itself and does not impact results for the field samples or the equipment blank. The data are usable for decision-making purposes.

In the ICP metals analysis, the analytes aluminum and boron were detected above the reporting limit in the MB. The aluminum result in the MB is less than 5% of the field sample results and is only similar in magnitude to the equipment blank (J1R115) result. The boron result in the LCS is less than 5% of the field sample results with the exception of samples J1R102, J1R103, J1R113, and the equipment blank (J1R115). The aluminum result for sample J1R115 and the boron results for samples J1R102, J1R103, J1R113, and (J1R115) may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for aluminum, antimony, calcium, iron, and silicon are outside the QC limits. Post-digestion spikes were prepared and analyzed by the laboratory with acceptable results. For most of these analytes the original spiking concentration was small relative to the native concentration in the matrix. Therefore, the initial MS result is more a measure of the natural heterogeneity of the sample matrix than the efficiency of the extraction. The data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. All toxaphene results in SDG KP0129 may be considered estimated. Estimated data are usable for decision-making purposes.

In the Method 300 anions analysis, holding times were exceeded by more than twice the accepted limit for nitrate, nitrite, and orthophosphate. Nondetected results for these analytes are discussed above in the Major Deficiencies section. Detected results may be considered estimated. Estimated data are usable for decision-making purposes.

SDG K3983

This SDG comprises one focused soil sample (J1R0V4) collected from beneath the west pipe and one statistical sample (J1R1P5) collected from the northern overburden pile of the 100-D-50:1 waste site. These field samples were analyzed for GEA, strontium-90, nickel-63, carbon-14, isotopic uranium, ICP metals, mercury, hexavalent chromium, IC anions, nitrate, nitrite, SVOA, PCBs, and pesticides. Minor deficiencies are as follows:

In the tritium analysis, the RPD calculated for the laboratory duplicate is above the QC limit at 114%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. The data are usable for decision-making purposes.

In the carbon-14 analysis, the RPD calculated for the laboratory duplicate is above the QC limit at 43%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. The data are usable for decision-making purposes.

In the tritium and carbon-14 analyses, no MSs were performed. All tritium and carbon-14 results in SDG KP0130 may be considered estimated. Estimated data are usable for decision-making purposes.

In the isotopic uranium analysis, no LCS was performed for uranium-235. All uranium-235 results for SDG KP0130 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOA, the LCS recovery and the MSD recovery for 2,4-dinitrophenol (22%, 16%) are below the QC range. Quantitation for 2,4-dinitrophenol is confirmed by acceptable MS results. Results for 2,4-dinitrophenol may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOA, the MSD recovery for 2,4,6-trichlorophenol (44%) is below the QC range. Quantitation is confirmed by acceptable MS and LCS results. Results for 2,4,6-trichlorophenol may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOA, the RPDs calculated between the MS and the MSD for 2,4,6-trichlorophenol (44%), 2,4-dinitrophenol (49%), and pentachlorophenol (43%) are above the QC limit. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. However, as noted above two of these compounds were associated with other minor deficiencies during this analysis. Phenols are subject to erratic chromatography. Results for these three analytes may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the laboratory noted indications of degradation of DDT to DDE and DDD. The acceptance criteria (20%) was exceeded but not excessive at 27.3%. The laboratory noted the chromatography was good based on the other tuning criteria. These compounds were not detected in the field samples, so no corrective action was performed. Results for DDT, DDE, and DDD may be considered estimated. Estimated data are usable for decision-making purposes.

In the chlorinated pesticide analysis, the analyte toxaphene was not included in the MS, MSD, or LCS samples. The laboratory typically quantitates toxaphene but does not include toxaphene in QA/QC samples. All toxaphene results in SDG KP0129 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for aluminum, antimony, calcium, iron, manganese, and silicon are outside the QC limits. Post-digestion spikes were prepared and analyzed by the laboratory with acceptable results. For most of these analytes the original spiking concentration was small relative to the native concentration in the matrix. Therefore, the initial MS result is more a measure of the natural heterogeneity of the sample matrix than the efficiency of the extraction. The data are usable for decision-making purposes.

In the Method 300 anions analysis, holding times were exceeded by more than twice the accepted limit for nitrate, nitrite, and orthophosphate. Nondetected results for these analytes are discussed above in the Major Deficiencies section. Detected results may be considered estimated. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field 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 logbooks (WCH 2006a, 2006b, 2012a), are shown in Table D-1. The main and QA/QC sample results are presented in Appendix B.

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

Sample Area	Main Sample	Duplicate Sample
Excavation area	J1R0V0	J1R0V5
Staging pile area	J1R0W2	J1R0W8
Northern overburden	J1R0X8	J1R101
Southern overburden	J1R102	J1R114
Test pit 3 pipe sediment (confirmatory)	J10VF2	J10VF3

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

The RPDs calculated for the field duplicate samples are above the acceptance criteria (30%) for silicon (51.3%) in the excavation area and for calcium 59.2% at test pit 3. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. 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 TDL, including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. No sample results required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-D-50:1 waste site verification (and confirmatory) 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-50:1 waste site concludes that the reviewed

data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes.

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

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