1213962

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

12-AMRP-0033

MAY 15 2012

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

Dear Mr. Faulk:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORMS NOS. 2012-004, 2012-005, 2012-006 AND SUPPORTING DOCUMENTATION FOR THE UPR-300-38, SOIL CONTAMINATION BENEATH THE 313 BUILDING, THE 313 ESSP, 313 EAST SIDE STORAGE PAD, AND THE 300-270, UNPLANNED RELEASE AT 313 BULDING, REVISION 0

Attached for your use are the approved Waste Site Reclassification Forms Nos. 2012-004, 2012-005, 2012-006, and supporting "Remaining Sites Verification Package for the UPR-300-38, Soil Contamination Beneath the 313 Building, the 313 ESSP, 313 East Side Storage Pad, and the 300-270, Unplanned Release at 313 Building," Rev.0. If you have questions, please contact me or your staff may contact R. F. Guercia, of my staff, at (509) 376-5494.

Sincerely,

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

AMRC:RFG

Attachment

cc w/attach:
L. E. Gadbois, EPA

cc w/o attach:
S. L. Feaster, WCH
M. L. Proctor, WCH
G. B. Snow, WCH

Administrative Record, H6-08

D. L. Plung, WCH
J. P. Shearer, CHPRC

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WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-004

Waste Site Code(s)/Subsite Code(s): UPR-300-38

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 UPR-300-38 waste site consisted of the contaminated soil beneath the 313 Building, as well as the foundation. The contamination resulted from multiple unplanned release events. Materials released to the soil beneath the building may have included uranium-bearing acid (nitric and sulfuric acid with uranium in solution), neutralized acid waste (typically sodium fluoride, sodium nitrate, sodium dichromate, and sodium sulfate in solution with precipitates of uranium, chromium, copper and zirconium), etch acids (nitric, hydrofluoric, sulfuric, and chromic acids), tetrachloroethene (perchloroethylene), sodium hydroxide solutions, and contaminated water.

Remediation of the UPR-300-38 waste site was performed from January 10, 2010, through June 2, 2011. The soil within the northern portion of the waste site footprint was excavated to an approximate average depth of 1 m (3.3 ft) below ground surface (bgs). The southern area of the waste site was excavated to an approximate average depth of 2 m (6.6 ft) bgs, with limited areas of deeper soil contamination to 5 m (16.4 ft) bgs. The resulting 15,204 bank cubic meters (19,887 bank cubic yards) of soil was disposed at the Environmental Restoration Disposal Facility (ERDF).

Verification sampling was performed to determine if the waste site meets the remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington, (300-FF-2 ROD) (EPA 2001) and in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington (300 Area RDR/RAWP) (DOE-RL 2009). The UPR-300-38 waste site is subject to cleanup standards for an industrial land-use scenario. The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling results support a reclassification of the UPR-300-38 waste site to Interim Closed Out. The current site conditions achieve the RAGs, RAOs, and cleanup levels established by the 300-FF-2 ROD (EPA 2001) and the 300 Area RDR/RAWP (DOE-RL 2009). Remedial actions were performed so as to allow industrial land use and to protect groundwater and the Columbia River. The results of verification sampling show that residual contaminant concentrations meet human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep). The waste site contamination does not extend into the deep-zone soils. Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001). The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the UPR-300-38, Soil Contamination Beneath the 313 Building, 313 ESSP, East Side Storage Pad, and 300-270, Unplanned Release at 313 Building* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-004

Waste Site Code(s)/Subsite Code(s): UPR-300-38

Project Manager 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:

The UPR-300-38 waste site was remediated to achieve cleanup levels for an industrial land use. Therefore, institutional controls to maintain industrial land use of these sites are required as established in the 300-FF-2 ROD (EPA 2001).

M. S. French	M S French	4/25/12
DOE Federal Project Director (printed)	Signature	Date
N/A		
Ecology Project Manager (printed)	Signature	Date
L. E. Gadbois	Larry Gadbois	April 30 '12
EPA Project Manager (printed)	Signature	Date

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-005

Waste Site Code(s)/Subsite Code(s): 313 ESSP

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 313 ESSP, 313 East Side Storage Pad waste site is the footprint of a large concrete pad that was adjacent to the southeast side of the 313 Building and included an asphalt ramp that connected the pad to Ginko Street. Previously the site staged radiological waste from 313 Building operations and, during fuel fabrication operations, staged mixed waste, including byproduct waste materials from the fuels fabrication process and neutralized solids from the 313 Recovery Operations process. The unit was also used to stage raw materials received by rail cars.

Remediation of a large portion of the 313 ESSP waste site was performed by the excavation of concrete, asphalt, and underlying soil during the remediation of the UPR-300-38 waste site and the adjacent area near the footprint of the former 303-F Building. This work was performed on July 8, 2011. The soil within the waste site footprint was excavated to a depth of 1 m (3.3 ft) below ground surface, and the resulting 153 bank cubic meters (BCM) (205 bank cubic yards [BCY]) of soil was disposed at the Environmental Restoration Disposal Facility (ERDF). Approximately 98 BCM (128 BCY) was associated with the UPR-300-38 excavation; the remainder (55 BCM [72 BCY]) was associated with the 313 ESSP excavation near the footprint of the former 303-F Building. An additional 38 BCM (50 BCY) was removed from the northeast corner and the southern edge of the 313 ESSP waste site on August 26, 2011, resulting in a total of 191 BCM (250 BCY) of debris and soil removed from the 313 ESSP waste site.

Verification sampling was performed to determine if the waste site meets the remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington, (300-FF-2 ROD) (EPA 2001) and in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington (300 Area RDR/RAWP) (DOE-RL 2009). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling results support a reclassification of the 313 ESSP waste site to Interim Closed Out. The current site conditions achieve the RAGs, RAOs, and cleanup levels established by the 300-FF-2 ROD (EPA 2001) and the 300 Area RDR/RAWP (DOE-RL 2009). Remedial actions were performed so as to allow industrial land use and to protect groundwater and the Columbia River. The results of verification sampling show that residual contaminant concentrations meet human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep). The waste site contamination does not extend into the deep-zone soils. Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001). The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the UPR-300-38, Soil Contamination Beneath the 313 Building, 313 ESSP, East Side Storage Pad, and 300-270, Unplanned Release at 313 Building* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-005

Waste Site Code(s)/Subsite Code(s): 313 ESSP

Project Manager 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:

The 313 ESSP waste site was remediated to achieve cleanup levels for an industrial land use. Therefore, institutional controls to maintain industrial land use of these sites are required as established in the 300-FF-2 ROD (EPA 2001).

M. S. French	M S French	4/25/12
DOE Federal Project Director (printed)	Signature	Date
N/A		
Ecology Project Manager (printed)	Signature	Date
L. E. Gadbois	Larry Gadbois	April 30 '12
EPA Project Manager (printed)	Signature	Date

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-006

Waste Site Code(s)/Subsite Code(s): 300-270

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 300-270 waste site is an unplanned release of a milky-white flow of water that came out of a pipe located below the loading dock on the east side of the 313 Building. The dock was used by Richland Specialty Extrusions to store cylinders of metal (e.g., aluminum). The pipe drained storm water from the roof of the 313 Building. The release was on the surface of the ground, in an area of compacted gravel and soil.

Remediation of the 300-270 waste site was performed May 23, 2011. The soil within the waste site footprint was excavated to a depth of 0.5 m (1.6 ft) below ground surface, and the resulting 39.7 bank cubic meters (51.9 bank cubic yards) of soil was disposed at the Environmental Restoration Disposal Facility (ERDF).

Verification sampling was performed to determine if the waste site meets the remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington, (300-FF-2 ROD) (EPA 2001) and in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington (300 Area RDR/RAWP) (DOE-RL 2009). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling results support a reclassification of the 300-270 waste site to Interim Closed Out. The current site conditions achieve the RAGs, RAOs, and cleanup levels established by the 300-FF-2 ROD (EPA 2001) and the 300 Area RDR/RAWP (DOE-RL 2009). Remedial actions were performed so as to allow industrial land use and to protect groundwater and the Columbia River. The results of verification sampling show that residual contaminant concentrations meet human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep). The waste site contamination does not extend into the deep-zone soils. Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001). The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the UPR-300-38, Soil Contamination Beneath the 313 Building, 313 ESSP, East Side Storage Pad, and 300-270, Unplanned Release at 313 Building* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 300-FF-2 **Control No.:** 2012-006

Waste Site Code(s)/Subsite Code(s): 300-270

Project Manager 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:

The 300-270 waste site was remediated to achieve cleanup levels for an industrial land use. Therefore, institutional controls to maintain industrial land use of these sites are required as established in the 300-FF-2 ROD (EPA 2001).

M. S. French	MS French	4/25/12
DOE Federal Project Director (printed)	Signature	Date
N/A		
Ecology Project Manager (printed)	Signature	Date
L. E. Gadbois	Larry Gadbois	April 30 '12
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE UPR-300-38, SOIL CONTAMINATION BENEATH THE 313 BUILDING, THE 313 ESSP, 313 EAST SIDE STORAGE PAD, AND THE 300-270, UNPLANNED RELEASE AT 313 BUILDING

Attachment to Waste Site Reclassification Forms 2012-004, 2012-005, and 2012-006

March 2012

REMAINING SITES VERIFICATION PACKAGE FOR THE UPR-300-38, SOIL CONTAMINATION BENEATH THE 313 BUILDING, THE 313 ESSP, 313 EAST SIDE STORAGE PAD, AND 300-270, UNPLANNED RELEASE AT 313 BUILDING

EXECUTIVE SUMMARY

The UPR-300-38, Soil Contamination Beneath the 313 Building waste site (UPR-300-38), the 313 ESSP, 313 East Side Storage Pad waste site (313 ESSP), and the 300-270, Unplanned Release at 313 Building waste site (300-270) are either within or immediately adjacent to the footprint of the demolished 313 Building. The 313 Building was located at the north end of the main 300 Area. It was located north of Ginko Street, east of the former locations of the 303K, 305, and 314 Buildings, and west of the former locations of the 3712 and 3720 Buildings.

The UPR-300-38 waste site consisted of contaminated soil beneath the 313 Building, as well as the foundation. The contamination resulted from multiple unplanned release events. The 313 ESSP waste site was the footprint of a large concrete pad adjacent to the southeastern side of the former 313 Building, with an asphalt ramp that connected the pad to Ginko Street. The 300-270 waste site was the area of a release of whitish storm water that came from a pipe under the loading dock on the east side of the former 313 Building. The pipe drained the roof of the former 313 Building.

Remediation of the UPR-300-38 waste site was performed from January 10, 2010, through June 2, 2011. Remediation of a large portion of the 313 ESSP waste site was performed by the excavation of concrete, asphalt, and underlying soil during the remediation of the UPR-300-38 waste site and the adjacent area near the footprint of the former 303-F Building. This work was performed on July 8, 2011. The northeast corner and the southern edge of the 313 ESSP waste site was excavated further on August 26, 2011. Remediation of the 300-270 waste site was performed May 23, 2011. A total of 15,435 bank cubic meters (20,194 bank cubic yards) of soil and debris from the remediation of all three waste sites was disposed at the Environmental Restoration Disposal Facility.

Verification sampling was conducted on December 16 and 19, 2011, and January 26, 2012. A reclassification of Interim Closed Out for the UPR-300-38, 313 ESSP, and 300-270 waste sites is supported based on the verification sampling results. The results of verification sampling show that residual contaminant concentrations meet human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep) as established in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (300 Area RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington* (300-FF-2 ROD) (EPA 2001). A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the UPR-300-38, 313 ESSP, and 300-270 waste sites in accordance with the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007). Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001).

Table ES-1. Summary of Remedial Action Goals for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain dose rate of <15-mrem/yr above background over 1,000 years.	The maximum all pathways dose rate predicted by sum of fractions evaluations using individual radionuclide dose equivalent lookup values is 13.85 mrem/yr over 1,000 years.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct-exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The direct-exposure cumulative hazard quotient (9.0×10^{-1}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	All excess cancer risk for individual carcinogens is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The direct-exposure total excess cancer risk (1.5×10^{-8}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	All radionuclides were quantified below groundwater/river protection RAGs [d].	Yes
	Attain national primary drinking water standards [a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5 [b].	No radionuclides are predicted to reach groundwater in 1,000 years [d].	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L) [c].	None of the uranium isotopes associated with sample data were predicted to migrate to groundwater within 1,000 years [d].	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Statistical or maximum detected results for copper, lead, uranium, vanadium, zinc, and total PCBs (aroclor-1248, aroclor-1254, and aroclor-1260) exceed groundwater and river protection RAGs. However, it is predicted that these constituents will not reach groundwater (and, therefore, the Columbia River) within 1,000 years [e]. Therefore, their 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 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] The RESRAD Calculation Brief (see Calculation 0300X-CA-V0155, *UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations* in Appendix A) determined that no radionuclides are predicted to reach groundwater within 1,000 years.

[e] Based on the RESidual Radioactivity (RESRAD) modeling discussed in Appendix B of the 300 Area RDR/RAWP (DOE-RL 2009), residual concentrations of copper, lead, uranium, vanadium, zinc, and total PCBs (aroclor-1248, aroclor-1254, and aroclor-1260) are not expected to migrate vertically in 1,000 years (based on the lowest distribution coefficient of the contaminants [uranium] of 8.9 mL/g). Therefore, residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
PCB = polychlorinated biphenyl
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)

Soil cleanup levels were established in the 300-FF-2 ROD (EPA 2001) based on a limited ecological risk assessment. Although not required by the 300-FF-2 ROD (EPA 2001), comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* 173-340, Table 749-3, were boron, copper, lead, mercury, uranium, vanadium, zinc, and polychlorinated biphenyl mixtures (total). The U.S. Environmental Protection Agency's ecological soil screening levels were exceeded for antimony, cadmium, copper, lead, manganese, vanadium, and zinc. Exceeding screening values does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, cadmium, manganese, and mercury are below Hanford Site background levels (DOE-RL 2009), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THEUPR-300-38, SOIL CONTAMINATION BENEATH THE 313 BUILDING, THE 313 ESSP, 313 EAST SIDE STORAGE PAD, AND 300-270, UNPLANNED RELEASE AT 313 BUILDING

STATEMENT OF PROTECTIVENESS

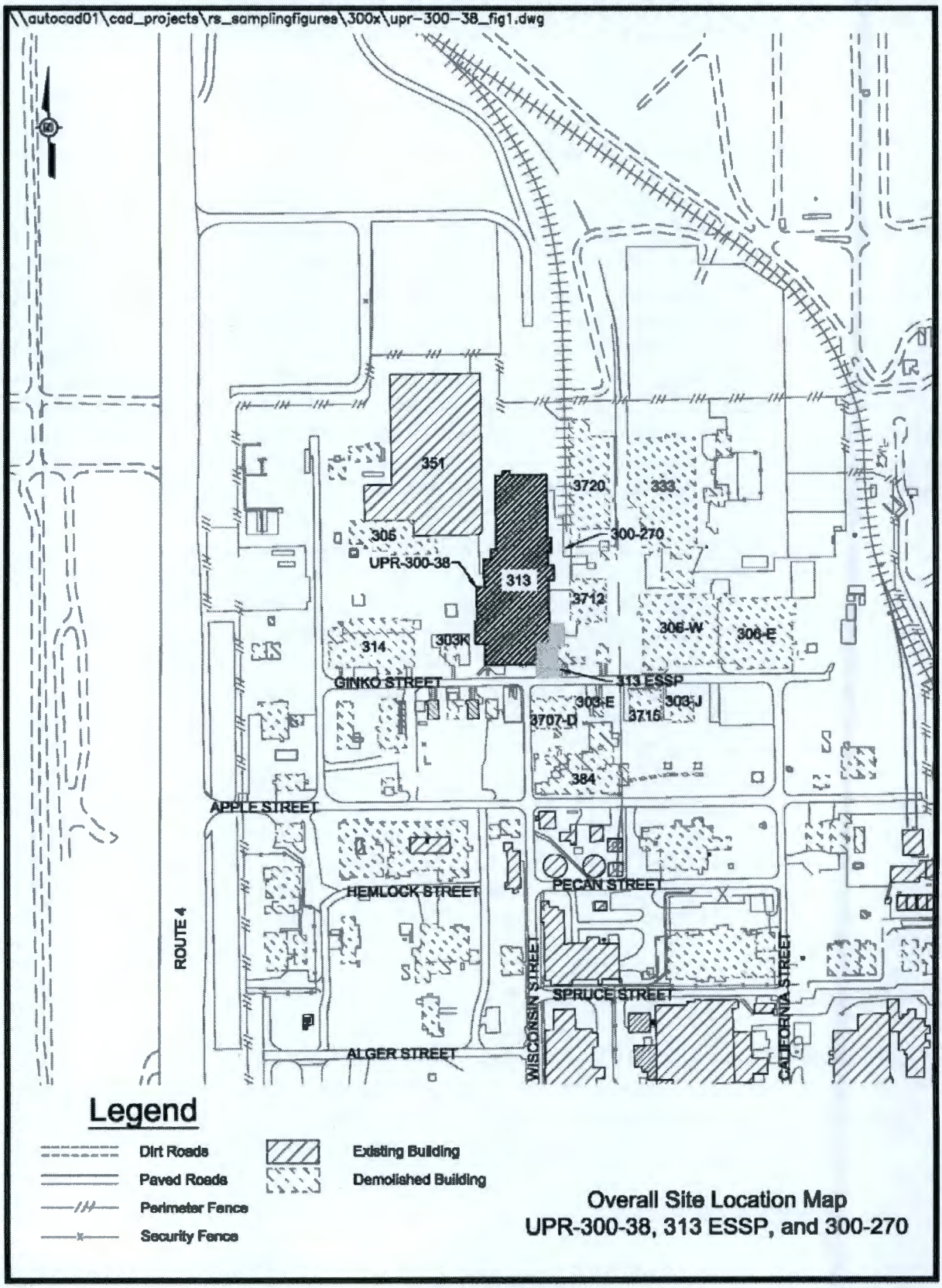
The UPR-300-38, Soil Contamination Beneath the 313 Building waste site (UPR-300-38), the 313 ESSP, 313 East Side Storage Pad waste site (313 ESSP), and the 300-270, Unplanned Release at 313 Building waste site (300-270) excavation verification sampling data demonstrate that these sites meet the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (300 Area RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington* (300-FF-2 ROD) (EPA 2001). The excavation area is interim closed out using the human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep). The waste site contamination does not extend into the deep-zone soils. Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001).

Soil cleanup levels were established in the 300-FF-2 ROD (EPA 2001) based on a limited ecological risk assessment. Although not required by the 300-FF-2 ROD (EPA 2001), comparison against ecological risk screening levels has been made for the site contaminants of potential concern (COPCs) and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* (WAC) 173-340, Table 749-3, were boron, copper, lead, mercury, uranium, vanadium, zinc, and polychlorinated biphenyl (PCB) mixtures (total). The U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for antimony, cadmium, copper, lead, manganese, vanadium, and zinc. Exceeding screening values does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, cadmium, manganese, and mercury are below Hanford Site background levels (DOE-RL 2009), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

GENERAL SITE INFORMATION AND BACKGROUND

The UPR-300-38, 313 ESSP, and 300-270 waste sites are either within or immediately adjacent to the footprint of the demolished 313 Building. The 313 Building was located at the north end of the main 300 Area. It was located north of Ginko Street, east of the former locations of the 303K, 305, and 314 Buildings, and west of the former locations of the 3712 and 3720 Buildings (Figure 1).

Figure 1. The UPR-300-38, 313 ESSP, and 300-270 Waste Sites Location Map.



The UPR-300-38 waste site consisted of contaminated soil beneath the 313 Building, as well as the foundation (Figure 2). The contamination resulted from multiple unplanned release events. The 313 ESSP waste site was the footprint of a large concrete pad adjacent to the southeastern side of the former 313 Building, with an asphalt ramp that connected the pad to Ginko Street. The 300-270 waste site was the area of a release of whitish storm water that came from a pipe under the loading dock on the east side of the former 313 Building. The pipe drained the roof of the former 313 Building.

Figure 2. Aerial View of the 313 Building Area in 1982 (View to Northwest).

The 313 Building

The 313 Building was constructed in 1943 to house manufacturing equipment for production of fuel for the Hanford Site's single-pass reactors. Fuel production began in mid-1944 and continued through the early 1950s. The facility was then expanded to the north in mid-1953 to allow for increased fuel production, and the expansion project was completed by 1956. In the late 1960s, a process that included nickel-plating of the bare uranium cores prior to cladding was developed and installed. This process continued until 1971, and the six fuel production lines were shut down concurrent with shutdown of the single-pass reactors. Fabrication activities continued until the N Reactor entered the standby phase in 1987. The northern end of the

building was leased to an offsite commercial company for the production of aluminum billets and components between 1995 and 2001.

UPR-300-38

The UPR-300-38 waste site consists of the contaminated soil beneath the 313 Building, as well as the foundation. The contamination resulted from multiple unplanned release events. Materials released to the soil beneath the building may have included uranium-bearing acid (nitric and sulfuric acid with uranium in solution), neutralized acid waste (typically sodium fluoride, sodium nitrate, sodium dichromate, and sodium sulfate in solution with precipitates of uranium, chromium, copper and zirconium), etch acids (nitric, hydrofluoric, sulfuric, and chromic acids), tetrachloroethene (perchloroethylene), sodium hydroxide solutions, and contaminated water.

313 ESSP

The 313 ESSP waste site previously staged radiological waste from 313 Building operations and, during fuel fabrication operations, staged mixed waste from the 313 Building centrifuge and uranium waste from the 313 Building filter press. The unit was also used to stage raw materials received by rail cars.

300-270

The 300-270 waste site was an unplanned release of a milky-white flow of water that came out of a pipe located below the loading dock on the east side of the 313 Building. The pipe drained storm water from the roof of the 313 Building. The release was on the surface of the ground in an area of compacted gravel and soil.

REMEDIAL ACTION SUMMARY

Remediation of the UPR-300-38 waste site was performed from January 10, 2010, through June 2, 2011. The soil within the northern portion of the waste site footprint was excavated to an approximate average depth of 1 m (3.3 ft) below ground surface (bgs). The southern area of the waste site was excavated to an approximate average depth of 2 m (6.6 ft) bgs, with limited areas of deeper soil contamination to 5 m (16.4 ft) bgs. The resulting 15,204 bank cubic meters (BCM) (19,887 bank cubic yards [BCY]) of soil was disposed at the Environmental Restoration Disposal Facility (ERDF).

Remediation of a large portion of the 313 ESSP waste site was performed by the excavation of concrete, asphalt, and underlying soil during the remediation of the UPR-300-38 waste site and the adjacent area near the footprint of the former 303-F Building. This work was performed on July 8, 2011. The soil within the waste site footprint was excavated to a depth of 1 m (3.3 ft) bgs, and the resulting 153 BCM (205 BCY) of soil was disposed at ERDF. Approximately 98 BCM (128 BCY) was associated with the UPR-300-38 excavation; the remainder (55 BCM [72 BCY]) was associated with the 313 ESSP excavation near the footprint of the former 303-F Building. An additional 38 BCM (50 BCY) was removed from the northeast

corner and the southern edge of the 313 ESSP waste site on August 26, 2011, resulting in a total of 191 BCM of debris and soil removed from the 313 ESSP waste site.

Remediation of the 300-270 waste site was performed May 23, 2011. The soil within the waste site footprint was excavated to a depth of 0.5 m (1.6 ft) bgs, and the resulting 40 BCM (52 BCY) of soil was disposed at ERDF.

A post-excavation civil survey for the three waste sites is presented in Figure 3.

A post-excavation radiological survey for beta and gamma activity was conducted to confirm that waste site excavation was complete. No elevated beta or gamma activity was detected in the internal portions of the UPR-300-38, as shown in Figures 4 and 5. However, elevated beta activity was detected at the areas shown with green dots in Figure 6. These six areas were used as the locations for six focused samples (FS-2 to FS-7) as are discussed in Section 4.0. No elevated gamma activity was detected for the edge and internal portions of the UPR-300-38 waste site (Figure 7).

Elevated beta activity was detected at the 313 ESSP waste site in the areas shown with green dots in Figure 8. These nine areas will be used as locations for seven focused samples (FS-8 to FS-14) as discussed in Section 4.0. The two western-most green dots (Figure 8) and the two southern-most green dots (Figure 8) were each combined into one sampling location (FS-14 and FS-9) by selecting the location, in each case, with the higher net beta activity. No elevated gamma activity was detected for the 313 ESSP waste site, as shown in Figure 9.

Figure 10 illustrates the relationship of both the beta and the gamma surveys shown in Figures 8 and 9 with the 313 ESSP waste site boundary.

Figure 3. Post-Excavation Civil Survey for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites.

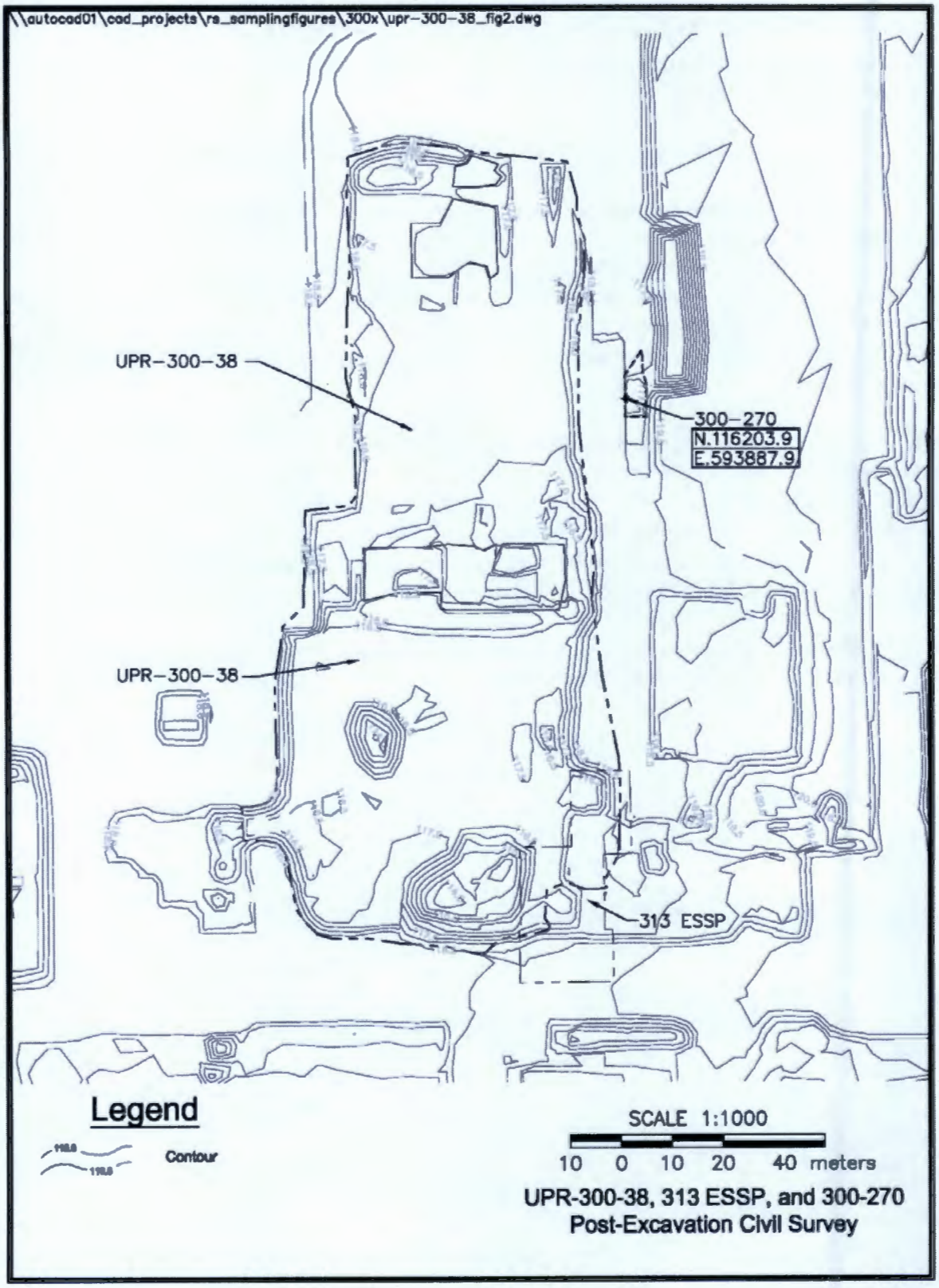


Figure 4. Post-Excavation Radiological Survey Beta Track Map for Internal Portions of the UPR-300-38 Waste Site.

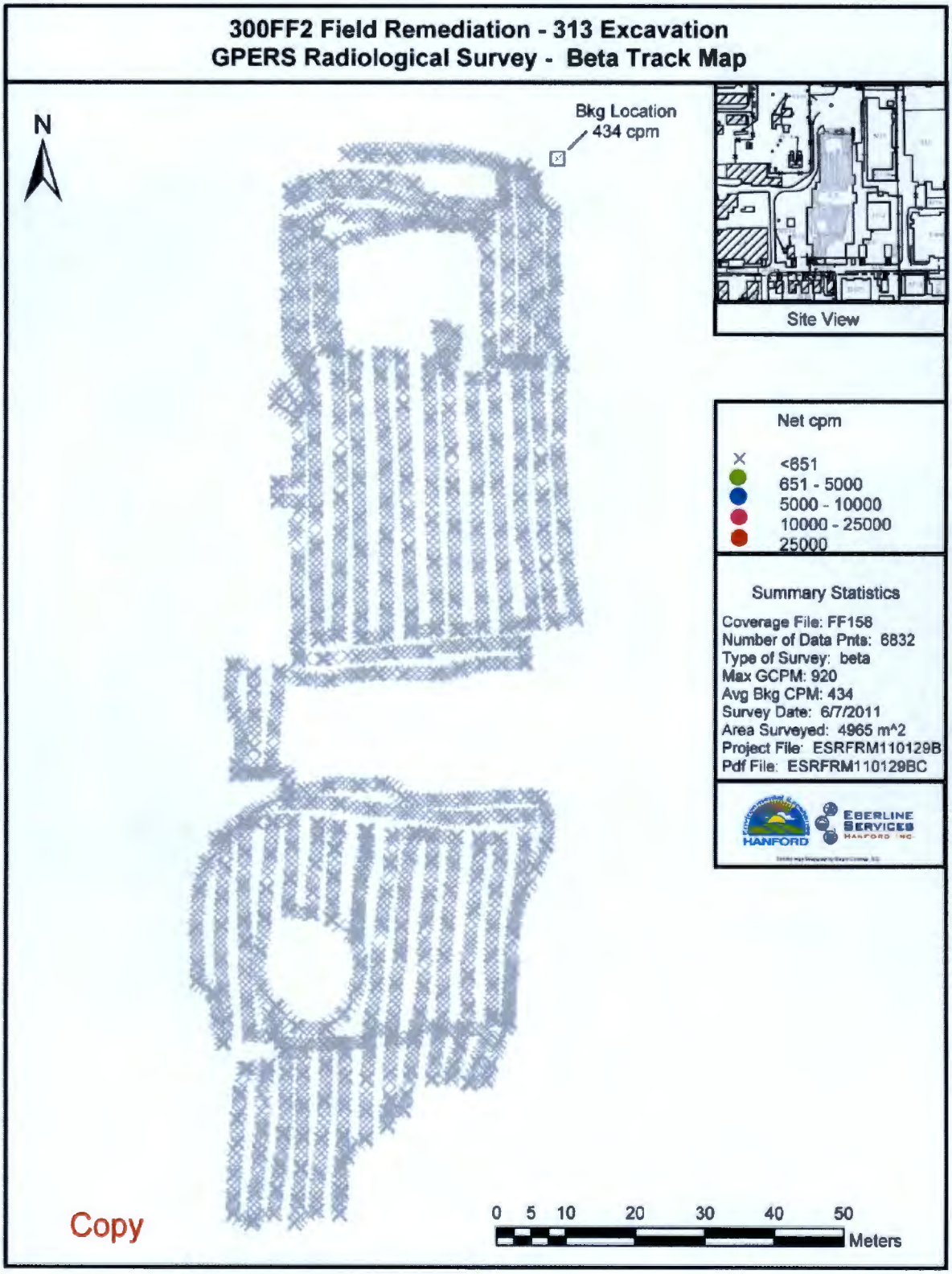


Figure 5. Post-Excavation Radiological Survey Gamma Track Map for Internal Portions of the UPR-300-38 Waste Site.

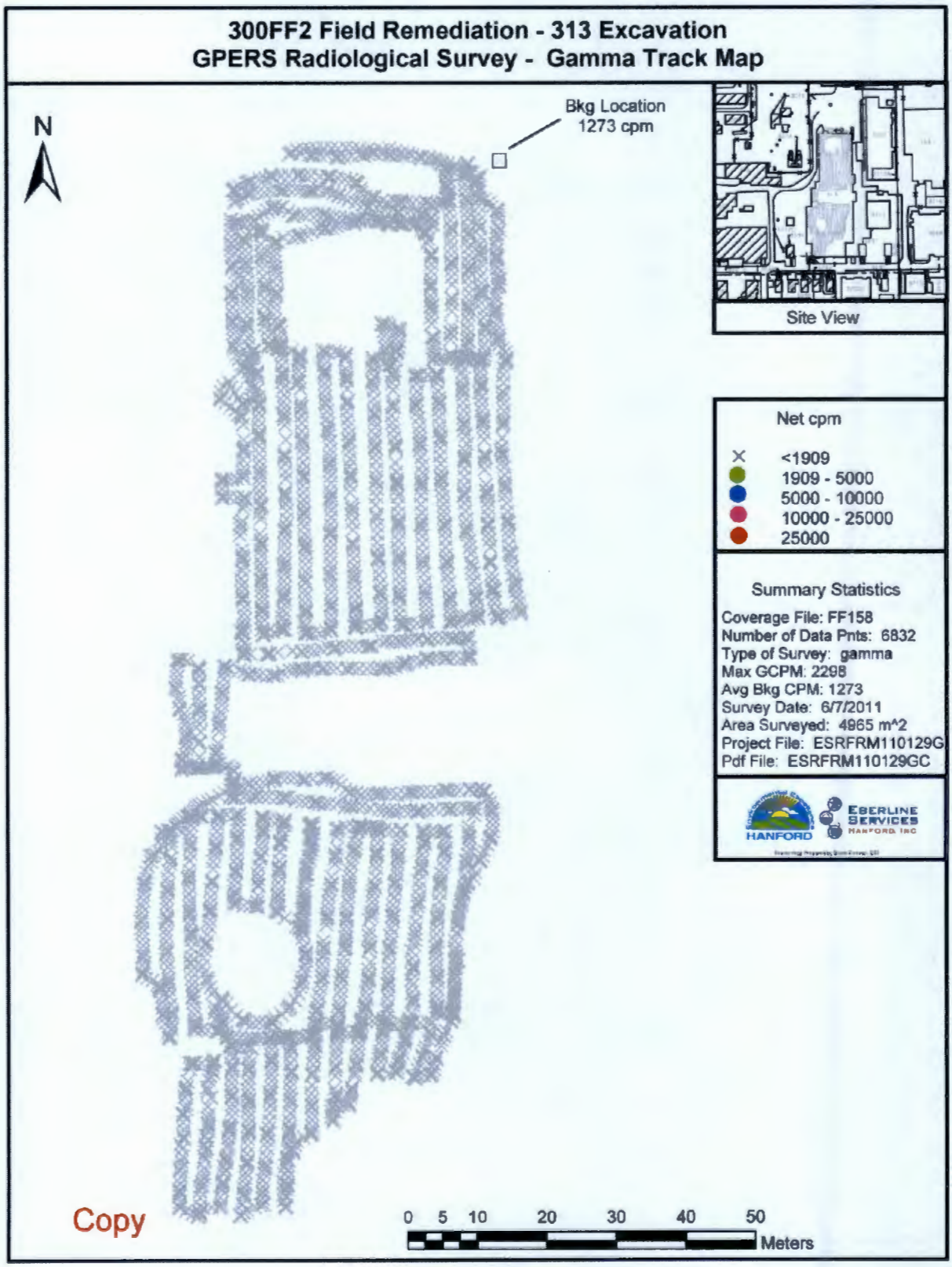


Figure 6. Post-Excavation Radiological Survey Beta Track Map for Edge and Internal Portions of the UPR-300-38 Waste Site.

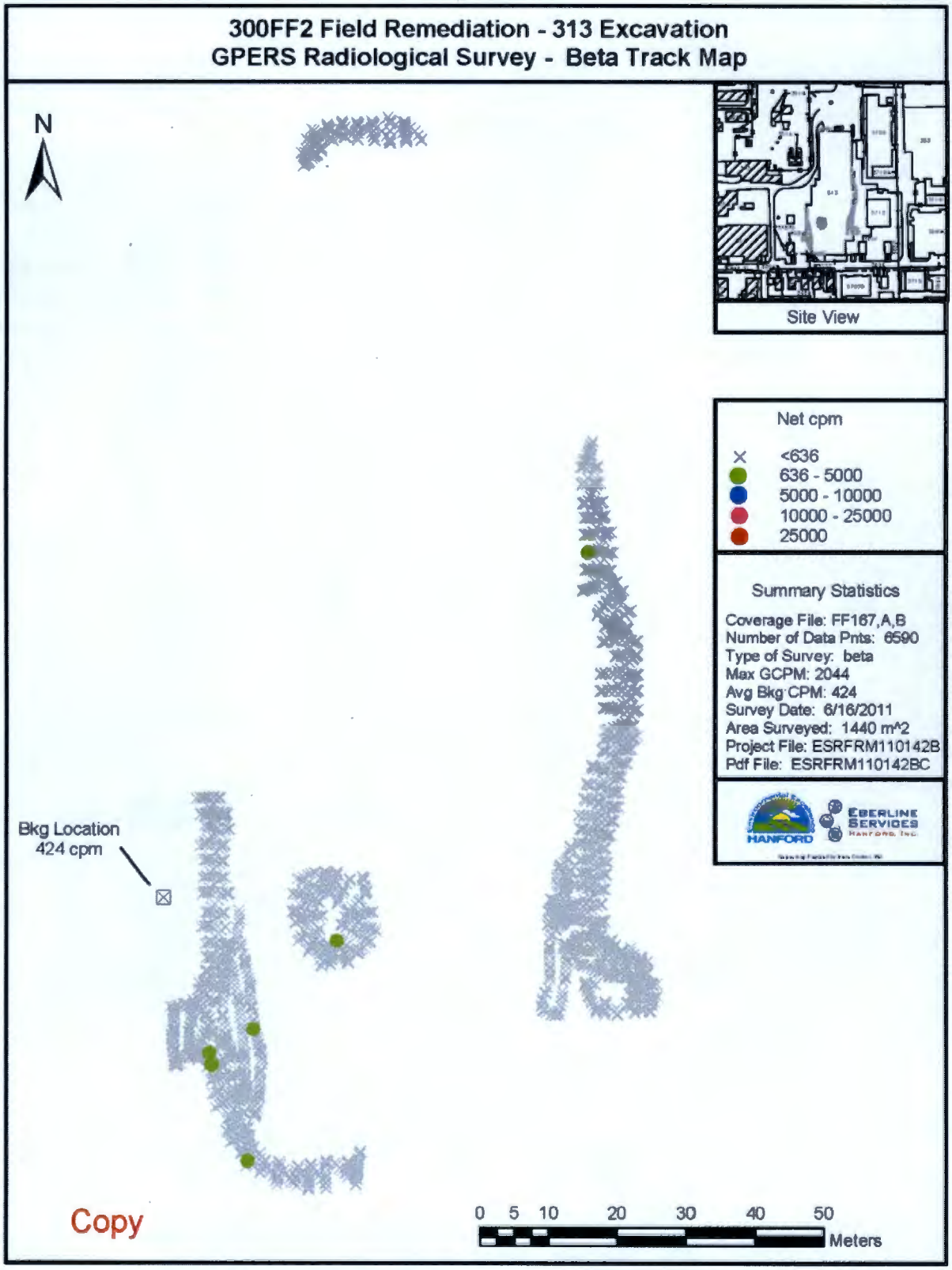


Figure 7. Post-Excavation Radiological Survey Gamma Track Map for Edge and Internal Portions of the UPR-300-38 Waste Site.

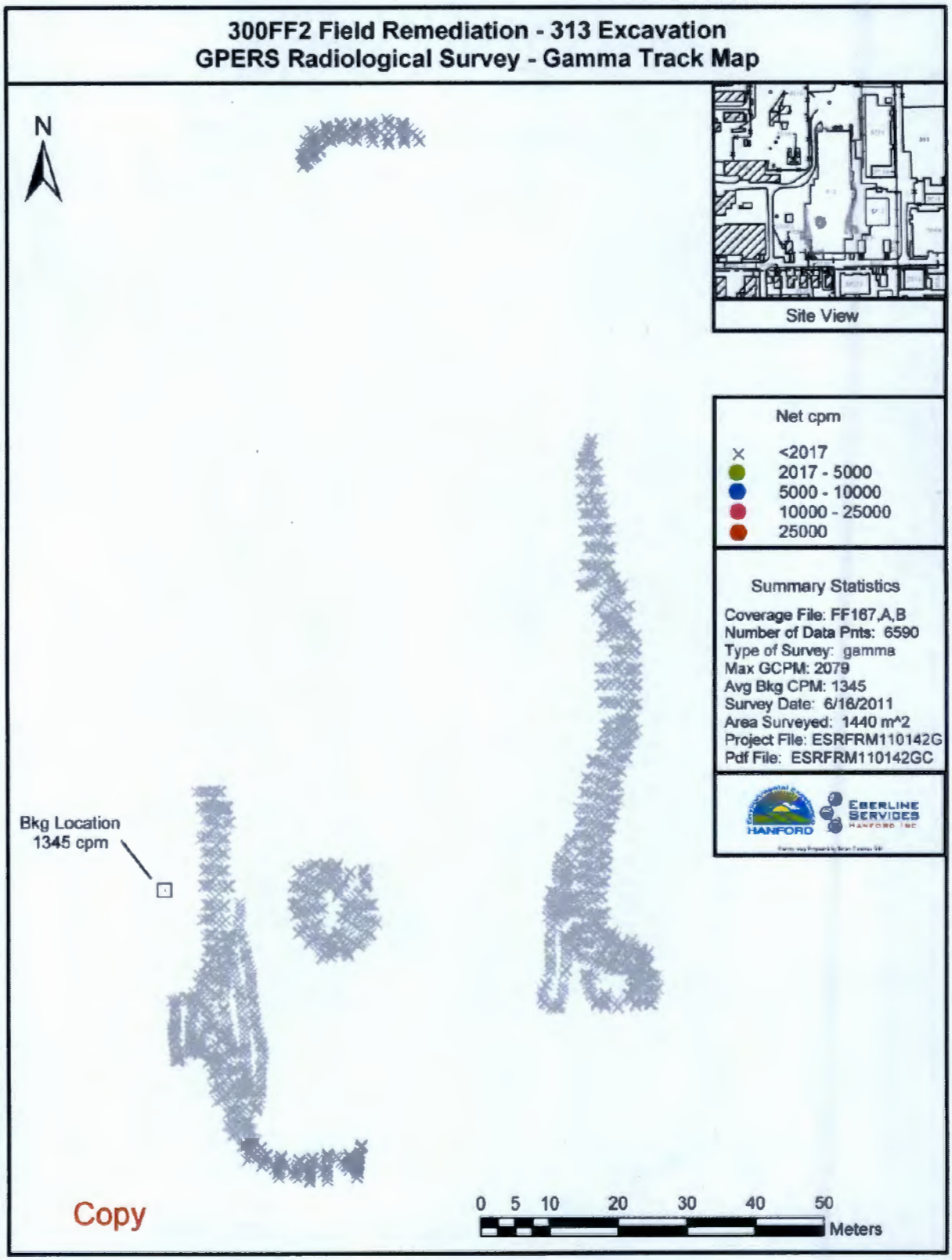


Figure 8. Post-Excavation Radiological Survey Beta Track Map for the 313 ESSP Waste Site.

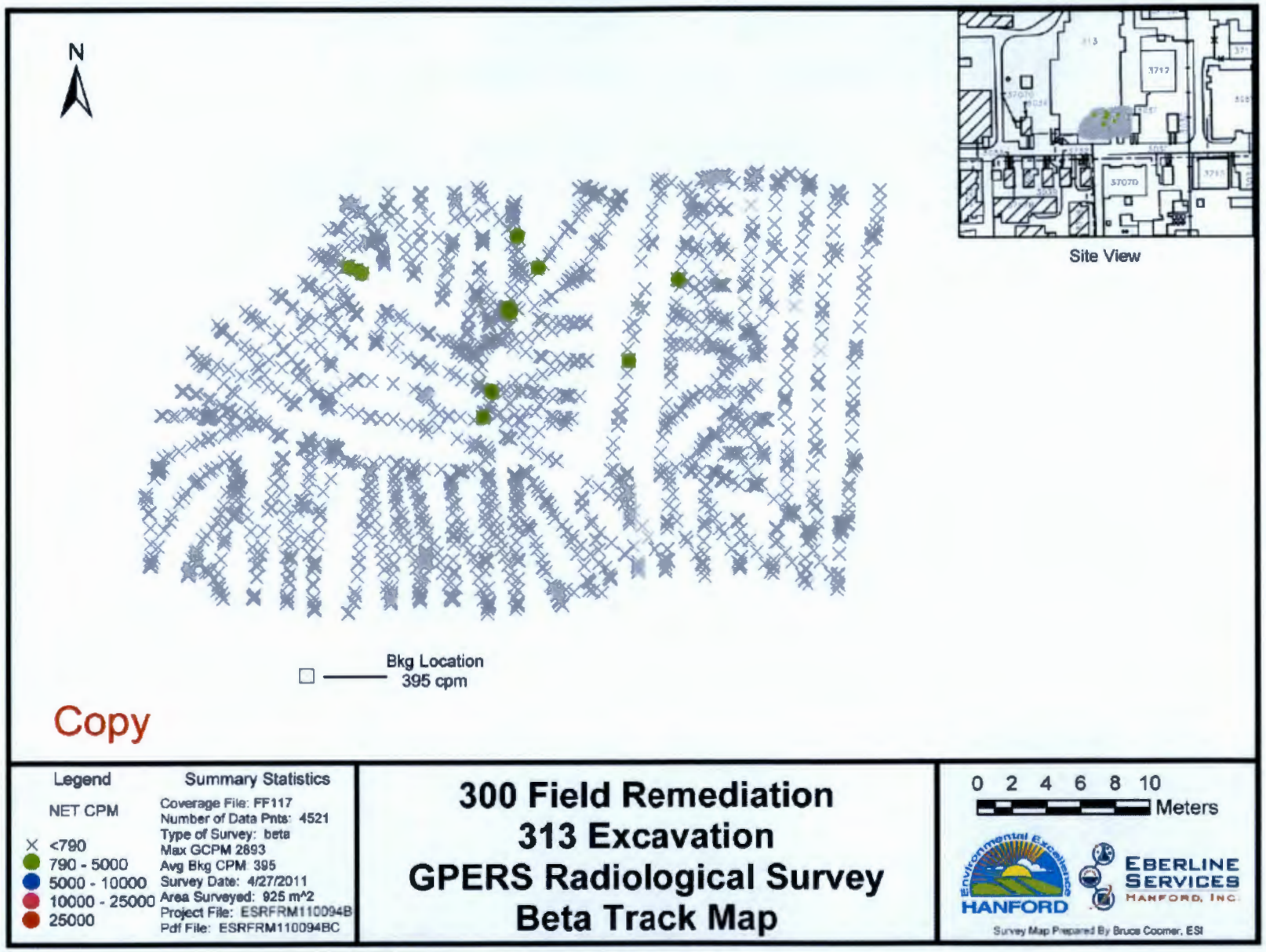


Figure 9. Post-Excavation Radiological Survey Gamma Track Map for the 313 ESSP Waste Site.

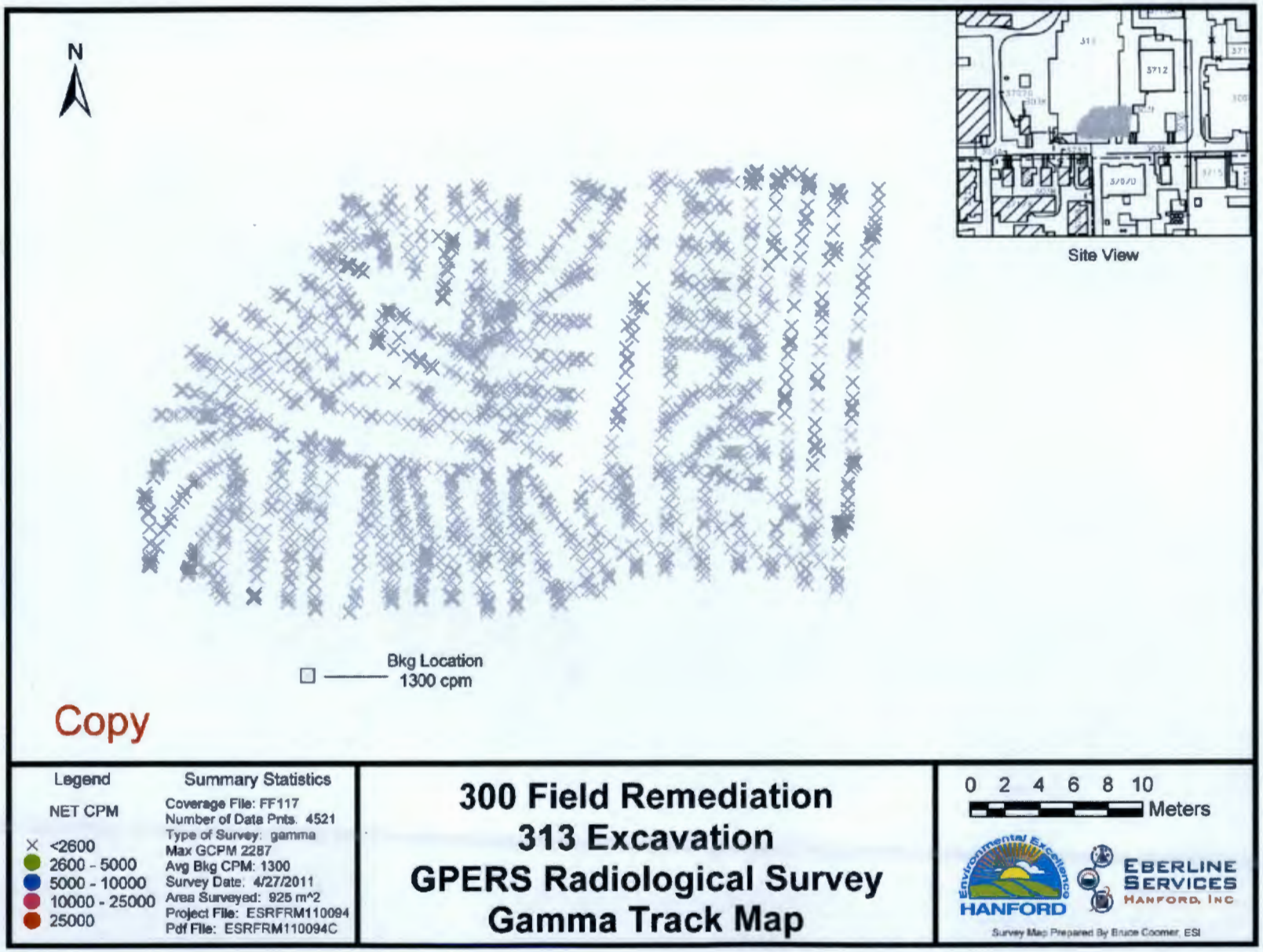
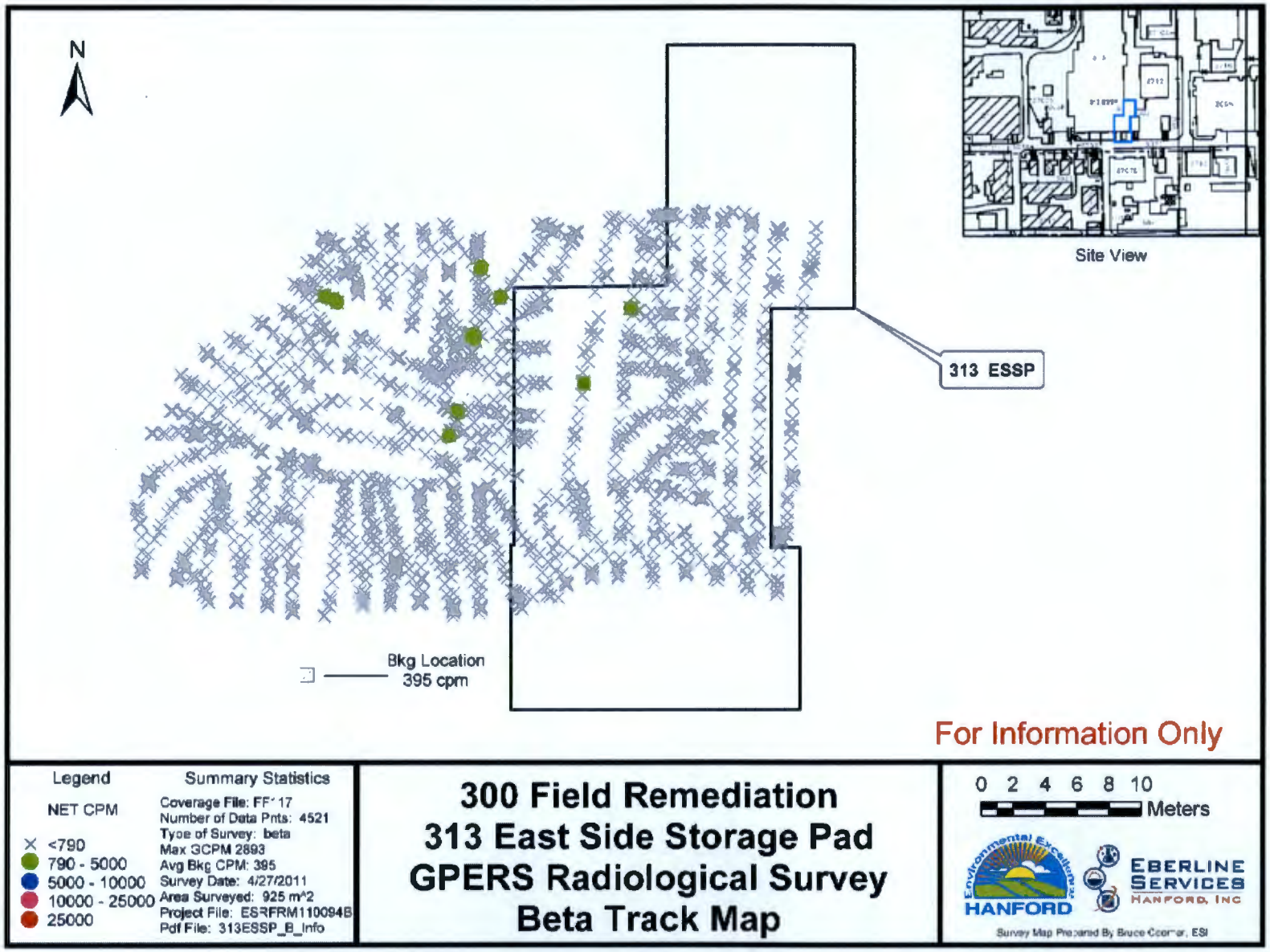


Figure 10. Post-Excavation Radiological Survey Beta Track Map Showing Relationship to the 313 ESSP Waste Site.



VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites was conducted on December 16 and 19, 2011, and January 26, 2012. These samples were collected to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the 300 Area RDR/RAWP (DOE-RL 2009) and the 300-FF-2 ROD (EPA 2001). The verification sample results are provided in Appendix A. The following subsections provide additional discussion of the information used to develop the verification sampling design. A more detailed discussion of the verification sample design can be found in the *Work Instruction for Verification Sampling of the UPR-300-28, Soil Contamination Beneath the 313 Building, 313 ESSP, 313 East Side Storage Pad, and 300-270, Unplanned Release at 313 Building* (WCH 2011).

Contaminants of Potential Concern

Based on the above information and historical information related to these waste sites, the COPCs for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites include isotopic uranium, lead, beryllium, chromium (total), zirconium, PCBs, sulfate, nitrate, and tetrachloroethene (perchloroethylene). Beta activity was detected during post-excavation radiological surveys; therefore, strontium-90 was added as a COPC. Also, due to this general indication of the presence of radionuclides and in combination with process history, gamma-emitting radionuclides were added as COPCs. Although not all are considered COPCs, antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc were evaluated for as part of the expanded inductively coupled plasma (ICP) metals analytical list.

Although not a regulated quantity, pH was added to aid in the evaluation of the data. The laboratory analyses that were performed to evaluate samples for the site COPCs are identified in Table 1.

Table 1. Laboratory Analytical Methods for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites. (2 Pages)

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Lead, beryllium, chromium (total), zirconium
Isotopic uranium	Uranium-233/234, uranium-235, uranium-238
PCB – EPA Method 8082	Polychlorinated biphenyls
IC anions [b] – EPA Method 300.0	Sulfate
NO_2/NO_3 [c] – EPA Method 353.2	Nitrogen in nitrate and nitrite
Strontium-90	Strontium-90
GEA – gamma spectroscopy	Gamma-emitting radionuclides
pH – EPA Method 9045 [d]	pH soil

Table 1. Laboratory Analytical Methods for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites. (2 Pages)

Analytical Method	Contaminant of Potential Concern
VOAs [e] – EPA Method 8260	Tetrachloroethene (perchloroethylene)

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, zinc, and zirconium.
[b] Analysis was performed for the expanded list of IC anions to include bromide, chloride, fluoride, phosphate, and sulfate.
[c] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353.2 was performed.
[d] pH is not a regulated quantity, but was added to aid in the evaluation of the data.
[e] Analyzed for a nominal list of VOCs including tetrachloroethene (perchloroethylene).

EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
IC = ion chromatography
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
VOA = volatile organic analysis
VOC = volatile organic compound

Verification Sample Design

This section describes the basis for selection of the sample design and determination of the number of verification samples. A statistical sampling approach was utilized for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites excavation. The footprint of the UPR-300-38, 313 ESSP, and 300-270 waste sites excavated area was delineated in Visual Sample Plan[1] and used as the basis for locations of 12 soil samples collected from the excavation footprint.

In addition, a focused sample (FS-1) was collected at the location of the former 300-270 drain outlet. The location of the soil beneath the existing drainpipe was determined visually in the field and was used as the basis for the FS-1 sample location. Thirteen focused soil samples (FS-2 to FS-14), one duplicate, and one split were also collected from the areas exhibiting elevated beta activity as discussed in Section 3.0. The uranium-233/234 and uranium-238 results for the December 2011 sample from the FS-14 location were both above the industrial direct-exposure remedial action goals (RAGs), at 309 pCi/g and 308 pCi/g, respectively. Additional remediation was conducted at the FS-14 location, removing soil to a depth of 1 m (3 ft), followed by collection of a focused, duplicate, and split samples on January 26, 2012. These samples were analyzed for isotopic uranium and gamma energy analysis, and the results were used for comparison against the cleanup criteria. The results from the remaining analyses from the original FS-14 sample were used for comparison against the cleanup criteria.

The verification samples are listed in Table 2, and sample locations are shown in Figure 11.

Verification Sampling Results

Evaluation of the combined UPR-300-38, 313 ESSP, and 300-270 waste sites verification data 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

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

Table 2. UPR-300-38, 313 EESP, and 300-270 Verification Statistical and Focused Sampling Summary Table. (2 Pages)

Sample	Sample Media	HEIS Number	Washington State Plane Coordinates		Sample Analysis
			Northing (m)	Easting (m)	
VSP-1	Surface Soil	J1N0C9	116095.2	593869.2	ICP metals [a], isotopic uranium, strontium-90, PCBs, IC anions, NO_2/NO_3, GEA, pH[b], VOA[c]
VSP-2	Surface Soil	J1N0F3	116119.4	593827.3	
VSP-3	Surface Soil	J1N0D2	116119.4	593855.2	
VSP-4	Surface Soil	J1N0H2	116119.4	593883.1	
VSP-5	Surface Soil	J1N0F9	116143.5	593841.3	
VSP-6	Surface Soil	J1N0H0	116143.5	593869.2	
VSP-7	Surface Soil	J1N0F5	116167.7	593827.3	
VSP-8	Surface Soil	J1N0F4	116191.8	593841.3	
VSP-9	Surface Soil	J1N0F6	116191.8	593869.2	
VSP-10	Surface Soil	J1N0F7	116216.0	593855.2	
VSP-11	Surface Soil	J1N0H4	116240.1	593841.3	
VSP-12	Surface Soil	J1N0F2	116240.1	593869.2	
FS-1	Surface Soil	J1N0H5	116203.9	593887.9	
FS-2	Surface Soil	J1N0D5	116115.0	593820.5	
FS-3	Surface Soil	J1N0D4	116101.3	593825.8	
FS-4	Surface Soil	J1N0H1	116133.2	593838.7	
FS-5	Surface Soil	J1N0D8	116116.8	593820.2	
FS-6	Surface Soil	J1N0F8	116189.8	593875.2	
FS-7	Surface Soil	J1N0F1	116120.2	593826.6	
FS-8	Surface Soil	J1N0D7	116112.1	593864.5	
FS-9	Surface Soil	J1N0D6	116107.5	593863.4	
FS-10	Surface Soil	J1N0D3	116116.5	593864.9	
FS-11	Surface Soil	J1N0D9	116114.8	593866.1	
FS-12	Surface Soil	J1N0D0	116109.3	593871.4	
FS-13	Surface Soil	J1N0D1	116114.0	593874.3	
FS-14[d]	Surface Soil	J1N0H3	116114.4	593855.8	
FS-14 resample	Surface Soil	J1N3H0	116114.4	593855.8	isotopic uranium, GEA
Duplicate FS-14 resample	Surface Soil	J1N3H1	116114.4	593855.8	
Split FS-14 resample	Surface Soil	J1N3H3	116114.4	593855.8	
Duplicate FS-5	Surface Soil	J1N0F0	116116.8	593820.2	ICP metals [a], isotopic uranium, strontium-90, PCBs, IC anions, NO_2/NO_3, GEA, pH[b], VOA[c]
Split FS-1	Surface Soil	J1N0H7	116203.9	593887.9	

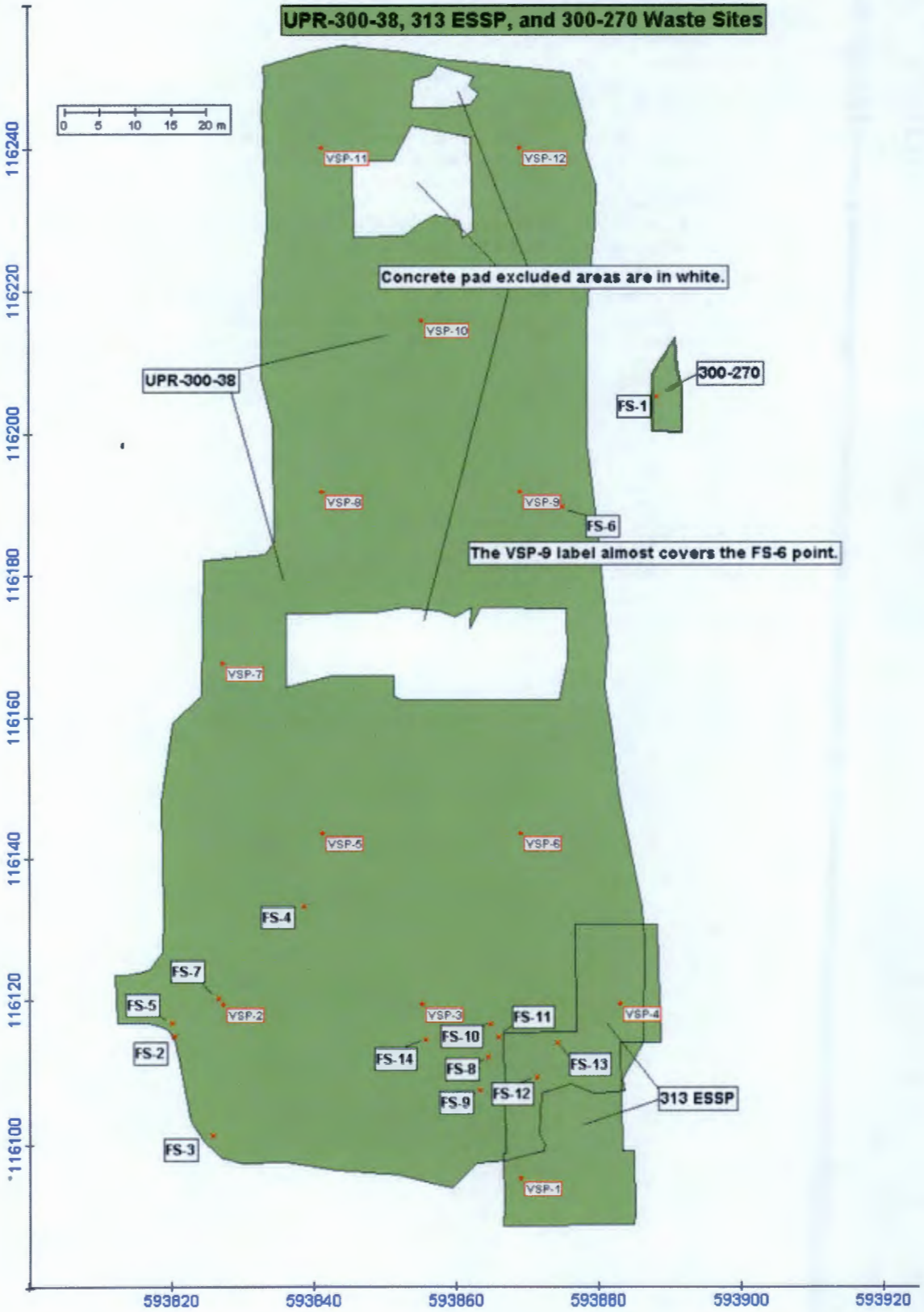
Table 2. UPR-300-38, 313 EESP, and 300-270 Verification Statistical and Focused Sampling Summary Table. (2 Pages)

Sample	Sample Media	HEIS Number	Washington State Plane Coordinates		Sample Analysis
			Northing (m)	Easting (m)	
Equipment blank	Silica sand	J1N0H6	NA	NA	ICP metals [a]

[a] Sample analysis for ICP metals will include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, zinc, and zirconium.
[b] pH is not a regulated quantity, but is added to aid in the evaluation of the data.
[c] VOCs include tetrachloroethene (perchloroethylene).
[d] The isotopic uranium and GEA results from the FS-14 sample (J1N0H3) were replaced with the results from the FS-14 resample (J1N3H0) results for the comparison against the cleanup criteria.

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
IC = ion exchange chromatography
ICP = inductively coupled plasma
NA = not applicable
PCB = polychlorinated biphenyl
VOA = volatile organic analysis
VOC = volatile organic compound

Figure 11. Statistical and Focused Verification Sample Locations for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites.



standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each detected COPC were computed for the UPR-300-38, 313 ESSP, and 300-270 waste sites excavation as specified by the 300 Area RDR/RAWP (DOE-RL 2009). 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.

Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2011) or other databases under WAC 173-340-740(3) for bismuth-214, lead-212, 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, bismuth-214, lead-212, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included. The radionuclides potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the site, but are not considered in the statistical calculations. These isotopes are naturally occurring, not related to the operational history of the site, and/or were detected below background levels. Comparisons of the statistical results for COPCs against the site RAGs for an industrial-exposure scenario are summarized in Table 3, and comparisons of the maximum focused results for COPCs against the site RAGs for an industrial-exposure scenario are summarized in Table 4. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to inclusion into the Hanford Environmental Information System (HEIS) and are presented as part of the 95% UCL calculation in Appendix A.

Table 3. Comparison of Statistical Samples Contaminant Concentrations to Action Levels for the UPR-300-38, 313 ESSP, and 300-270 Excavation Verification Sampling. (2 Pages)

COPC	Statistical or Maximum Result [b] (pCi/g)	Site Lookup Values [a] (pCi/g)		Does the Result Exceed Lookup Values?	Does the Result Pass RESRAD Modeling?
		Industrial Direct Exposure	Industrial Groundwater/River Protection		
Strontium-90	1.04	2,500	-- [c]	No	--
Uranium-233/234	1.54	167	127.4	No	--
Uranium-238	3.45	167	127.4	No	--
COPC	**Statistical or Maximum Result [b] (mg/kg)**	**Remedial Action Goals [a] (mg/kg)**		**Does the Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Industrial Direct Exposure	**Soil Cleanup Level for Groundwater Protection** / **Soil Cleanup Level for River Protection**		
Arsenic	3.51 (<BG)	58	20 [d] / 20 [d]	No	--
Barium	79.4 (<BG)	4,900 [e]	200 / 400	No	--
Beryllium	0.326 (<BG)	104 [e]	1.51 [d] / 1.51 [d]	No	--
Boron [f]	1.02	700,000	320 / -- [c]	No	--
Cadmium	0.124 (<BG)	139 [e]	0.81 [d] / 0.81 [d]	No	--
Chromium (total)	11.4 (<BG)	5,250,000	18.5 [d] / 18.5 [d]	No	--
Cobalt	7.18 (<BG)	1,050	15.7 [d] / -- [c]	No	--
Copper	24.6	130,000	59.2 / 22.0 [d]	Yes	Yes [g]

Table 3. Comparison of Statistical Samples Contaminant Concentrations to Action Levels for the UPR-300-38, 313 ESSP, and 300-270 Excavation Verification Sampling. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Industrial Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Lead	4.88 (<BG)	1,000	10.2 [d]	10.2 [d]	No	--
Lithium	8.54 (<BG)	7,000	33.5 [d]	-- [c]	No	--
Manganese	344 (<BG)	165,000	512 [d]	512 [d]	No	--
Mercury	0.021 (<BG)	1,050	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.396	17,500	8	-- [c]	No	--
Nickel	14.2 (<BG)	70,000	19.1 [d]	27.4	No	--
Vanadium	65.9 (<BG)	24,500	85.1 [d]	-- [c]	No	--
Zinc	52.5 (<BG)	1,050,000	480	67.8 [d]	No	--
Chloride	27.9 (<BG)	--	25,000	-- [c]	No	--
Fluoride	1.2 (<BG)	210,000	96	400	No	--
Nitrogen in nitrate and nitrite [h]	3.71 (<BG)	5,600,000	1,000	2,000	No	--
Sulfate	18.7 (<BG)	--	25,000	-- [c]	No	--
Acetone	0.00743	3,150,000	720	-- [c]	No	--
Methylene chloride	0.00245	17,500	0.50	0.94	No	--
Aroclor-1254	0.0255	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]
Aroclor-1260	0.0129	65.6	0.017 [i]	0.017 [i]	No	--
Total PCBs	0.0384	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]

[a] RAGs obtained from the 300 Area RDR/RAWP (DOE-RL 2009).

[b] Maximum or 95% UCL, depending on data censorship, as described in the *UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations* (Appendix A).

[c] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Ecology Cleanup Risk and Calculations database or other databases to calculate cleanup levels (WAC 173-40-730(3)(a)(iii), 1996 [Method B for surface waters]).

[d] Where cleanup levels are less than BG, cleanup levels default to BG per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers.

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], Ecology 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 BG value is available.

[g] Based on the RESRAD modeling discussed in Appendix B of the 300 Area RDR/RAWP (DOE-RL 2009), residual concentrations of copper and total PCBs (aroclor-1254 and aroclor-1260) are not expected to migrate vertically in 1,000 years (based on the lowest distribution coefficient of the constituents [copper] of 22 mL/g). Therefore, residual concentrations of copper and total PCBs (aroclor-1254 and aroclor-1260) are predicted to be protective of groundwater and the Columbia River.

[h] The results are evaluated as nitrogen in nitrate.

[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.

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

Table 4. Comparison of Focused Sample Contaminant Concentrations to Action Levels for the UPR-300-38, 313 ESSP, and 300-270 Excavation Verification Sampling. (2 Pages)

COPC	Maximum Result (pCi/g)	Site Lookup Values [a] (pCi/g)		Does the Result Exceed Lookup Values?	Does the Result Pass RESRAD Modeling?
		Industrial Direct Exposure	Industrial Groundwater/River Protection		
Cesium-137	0.312	25	-- [b]	No	--
Uranium-233/234	121	167	127.4	No	--
Uranium-235	8.23	16	13.2	No	--
Uranium-238	116	167	127.4	No	--

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Industrial Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	12.5 (<BG)	58	20 [c]	20 [c]	No	--
Barium	96.3 (<BG)	4,900 [d]	200	400	No	--
Beryllium	0.335 (<BG)	104 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.58	700,000	320	-- [f]	No	--
Cadmium	0.483 (<BG)	139 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	14.7 (<BG)	5,250,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.91 (<BG)	1,050	15.7 [c]	-- [f]	No	--
Copper	91.3	130,000	59.2	22.0 [c]	Yes	Yes [g]
Lead	76.7	1,000	10.2 [c]	10.2 [c]	Yes	Yes [g]
Lithium	12.4 (<BG)	7,000	33.5 [c]	-- [f]	No	--
Manganese	397 (<BG)	165,000	512 [c]	512 [c]	No	--
Mercury	0.140 (<BG)	1,050	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.996	17,500	8	-- [f]	No	--
Nickel	17.6 (<BG)	70,000	19.1 [b]	27.4	No	--
Uranium	449	505	53	106	Yes	Yes [g]
Vanadium	85.8	24,500	85.1 [b]	-- [f]	Yes	Yes [g]
Zinc	210	1,050,000	480	67.8 [c]	Yes	Yes [g]
Chloride	296	--	25,000	-- [f]	No	--
Fluoride	9.8	210,000	96	400	No	--
Nitrogen in nitrate and nitrite [h]	173	5,600,000	1,000	2,000	No	--
Sulfate	933	--	25,000	-- [f]	No	--
Acetone	0.00554	3,150,000	720	-- [f]	No	--
Aroclor-1248	0.0358	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]
Aroclor-1254	0.735	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]
Aroclor-1260	0.209	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]

Table 4. Comparison of Focused Sample Contaminant Concentrations to Action Levels for the UPR-300-38, 313 ESSP, and 300-270 Excavation Verification Sampling. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Industrial Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Total PCBs	0.980	65.6	0.017 [i]	0.017 [i]	Yes	Yes [g]

[a] RAGs obtained from the 300 Area RDR/RAWP (DOE-RL 2009).
[b] The RESRAD model predicts the constituent will not reach groundwater (or the Columbia River) within 1,000 years.
[c] Where cleanup levels are less than BG, cleanup levels default to BG per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers.
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], Ecology 1996) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State BG value is available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Ecology Cleanup Risk and Calculations database or other databases to calculate cleanup levels (WAC 173-40-730(3)(a)(iii), 1996 [Method B for surface waters]).
[g] Based on the RESRAD modeling discussed in Appendix B of the 300 Area RDR/RAWP (DOE-RL 2009), residual concentrations of contaminants with a distribution coefficient (K_d) greater than 7.7 mL/g are not expected to migrate vertically in 1,000 years (the lowest distribution coefficient of the constituents that exceed groundwater and Columbia River protection cleanup levels [uranium] is 8.9 mL/g). Therefore, residual concentrations of copper, lead, uranium, vanadium, zinc, and total PCBs (aroclor-1254 and aroclor-1260) are predicted to be protective of groundwater and the Columbia River.
[h] The results are evaluated as nitrogen in nitrate.
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.

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

CLEANUP VERIFICATION DATA EVALUATION

This section demonstrates that remedial actions at the combined UPR-300-38, 313 ESSP, and 300-270 waste sites have achieved the applicable RAGs developed to support industrial land use at the 300 Area as documented in the 300 Area RDR/RAWP (DOE-RL 2009).

NONRADIONUCLIDES

Direct Comparison to RAGs

Evaluation of the nonradionuclide verification statistical sampling results in Tables 3 and 4 show that all direct-exposure RAGs are met for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites. In the statistical samples, groundwater protection and Columbia River protection cleanup levels were exceeded for copper, aroclor-1254, and total PCBs (aroclor-1254 and aroclor-1260). In the focused samples, groundwater protection and Columbia River protection cleanup levels were exceeded for copper, lead, uranium, vanadium, zinc, aroclor-1248, aroclor-1254, aroclor-1260, and total PCBs. Generic RESidual RADioactivity (RESRAD) modeling discussed in Appendix B of the 300 Area RDR/RAWP (DOE-RL 2009) indicates that residual concentrations of the contaminants that exceed groundwater protection and Columbia

River protection cleanup levels are predicted not to migrate vertically within 1,000 years based on the contaminant with the lowest distribution coefficient (K_d value) of the contaminants that exceeded the RAGs: uranium with a K_d value of 8.9 mL/g. Therefore, residual concentrations of copper, lead, uranium, vanadium, zinc, aroclor-1248, aroclor-1254, aroclor-1260, and total PCBs are protective of groundwater (and thus the Columbia River).

Three-Part Test for Nonradionuclides

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. The application of the three-part test for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites remediation footprint is included in the statistical calculations (Appendix A). The results of this evaluation indicate the copper data set has one result greater than two times the soil RAGs for groundwater and river protection in the excavation. However, based on the RESRAD modeling discussed in Appendix B of the 300 Area RDR/RAWP (DOE-RL 2009), residual concentrations of copper are not expected to migrate vertically in 1,000 years (based on the K_d for copper of 22 mL/g). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

Direct Contact Noncarcinogenic Hazard Quotient Remedial Action Goal

Assessment of the risk requirements for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites was determined by calculation of the hazard quotient and excess carcinogenic risk. The requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. Hazard quotient and excess carcinogenic risk calculations for direct contact were conservatively performed for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites using the highest of the statistical or maximum values. Risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. All individual hazard quotients are below 1.0, and all individual excess carcinogenic risk values are below 1×10^{-6}. The direct contact cumulative hazard quotient for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites is 9.0×10^{-1}, and the cumulative excess carcinogenic risk value is 1.5×10^{-8}, satisfying the criteria of less than 1.0 and less than 1×10^{-5}, respectively. Therefore, the nonradionuclide risk requirements are met.

RADIONUCLIDES

Table 5 compares the statistical and focused radionuclide cleanup verification results (with the exception of uranium isotopes in FS-11, which were evaluated using site-specific RESRAD modeling) to direct-exposure single radionuclide 15 mrem/yr dose-equivalence values, and shows the sum of fractions evaluations.

Table 5. Attainment of Radionuclide Direct Exposure Remedial Action Goals for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites Statistical and Focused Samples.

COPC	95% UCL Statistical or MaximumValues [a] (pCi/g)	Activity Equivalent to 15 mrem/yr Dose [b] (pCi/g)	Fraction
Cesium-137	0.312	25	0.0125
Strontium-90	1.04	2,500	0.000416
Uranium-233/234	42.3	167	0.253
Uranium-235	4.37	16	0.273
Uranium-238	64.1	167	0.384
		Total	0.923
		Equivalent Dose (mrem/yr)	13.85

[a] The uranium-233/234, uranium-235, and uranium-238 values reported for sample FS-11 are evaluated in a site-specific RESRAD calculation (see Calculation 0300X-CA-V0155, *UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations* in Appendix A), and are not included in this table.

[b] Single radionuclide 15 mrem/yr dose-equivalence values and derivation methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (DOE-RL 2009).

COPC = contaminant of potential concern UCL = upper confidence limit
RESRAD = RESidual RADioactivity

The columns on the left side of the table are the COPCs and the 95% UCL or maximum values. The third column presents the single radionuclide 15 mrem/yr dose-equivalence activity, and the last column presents the statistical or maximum values divided by the dose-equivalence activity. As demonstrated by the summation of these fractions, the cumulative dose contributed by residual radionuclide populations is less than the 15 mrem/yr dose limitation.

Individual RESRAD runs were performed for focused sampling location FS-11. RESRAD evaluation of the FS-11 sampling location has been conducted using shallow-zone criteria throughout, so all-pathways radiological dose was evaluated as well as groundwater and river protection criteria. The maximum all-pathways dose rate for sample FS-11 is 12.4 mrem/yr at year zero (2012), which is below the dose limitation of 15 mrem/yr (see Calculation 0300X-CA-V0155, *UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations* in Appendix A).

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach, the field logbooks, and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA for the combined UPR-300-38, 313 ESSP, and 300-270 waste sites established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. All analytical data were found to be acceptable for decision-making purposes. The cleanup verification sample analytical data are stored in the ENRE project-specific database for data evaluation prior to archival in the HEIS and are summarized in Appendix A. The detailed DQA is presented in Appendix B.

SUMMARY FOR INTERIM CLOSURE

The UPR-300-38, 313 ESSP, and 300-270 waste sites have been evaluated in accordance with the 300-FF-2 ROD (EPA 2001) and the 300 Area RDR/RAWP (DOE-RL 2009). In accordance with this evaluation, the verification sampling and modeling results support a reclassification of the UPR-300-38, 313 ESSP, and 300-270 waste sites to Interim Closed Out. The excavation area is interim closed out using the human health direct-exposure cleanup levels for industrial land use and applicable standards for groundwater and river protection in the shallow zone (i.e., surface to 4.6 m [15 ft] deep). The waste site contamination does not extend into the deep-zone soils. Institutional controls to maintain industrial land use are required as established in the 300-FF-2 ROD (EPA 2001).

REFERENCES

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

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

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

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

DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 300 Area,* DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

EPA, 1989, *Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual, Part A; Interim Final*, EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 2001, *Interim Action Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

WAC 173-340, 2007, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

WCH, 2011, *Work Instruction for Verification Sampling of the UPR-300-28, Soil Contamination Beneath the 313 Building, 313 ESSP, 313 East Side Storage Pad, and 300-270, Unplanned Release at 313 Building*, 0300X-WI-G0019, Rev. 0, Washington Closure Hanford, Richland, Washington.

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

APPENDIX A

CALCULATIONS

APPENDIX A

CALCULATION BRIEF

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

UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification, 95% UCL Calculations, 0300X-CA-V0152, Rev. 0, Washington Closure Hanford, Richland, Washington.

UPR-300-38, 313 ESSP, and 300-270 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0300X-CA-V0154, Rev. 0, Washington Closure Hanford, Richland, Washington.

UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations, 0300X-CA-V0155, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

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

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CALCULATION COVER SHEET

Project Title: 300 Area Field Remediation **Job No. 14655**

Area: 300 Area

Discipline: Environmental *Calculation No: 0300X-CA-V0152

Subject: UPR-300-38, 313 ESSP, and 300-270 Waste Sites 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 = 17 Attm. 1 = 20 Total = 38	N. K. Schiffern N.K. Schiffern	J. D. Skoglie J. D. Skoglie	I. B. Berezovskiy I. B. Berezovskiy	M.L. Proctor ~~J. Ludowise~~ 5/1/12 M.L. Proctor	5/1/12

SUMMARY OF REVISION

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

Washington Closure Hanford **CALCULATION SHEET**

Originator	N. K. Schiffern	**Date**	02/27/12	**Calc. No.**	0300X-CA-V0152	**Rev. No.**	0
Project	300 Area Field Remediation	**Job No.**	14655	**Checked**	J. D. Skoglie	**Date**	02/27/12
Subject	UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations					**Sheet No.**	1 of 17

Summary

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

Table of Contents:
Sheets 1 to 4 - Calculation Sheet Summary
Sheet 5 to 8 - Calculation Sheet Verification Data Excavation
Sheet 9 to 11 - MTCA Results
Sheet 12 to 17 - Calculation Sheet Duplicate and Split Analysis
Attachment 1 - UPR-300-38, 313 ESSP, and 300-270 Waste Sites Verification Sampling Results (20 sheets)

Given/References:
1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are taken from DOE-RL (2009), DOE-RL (2001), and Ecology (1996).
3) DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) DOE-RL, 2011, 300 Area Remedial Action Sampling and Analysis Plan (SAP), DOE/RL-2001-48, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 300 Area* (RDR/RAWP), DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
6) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets),* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
7) Ecology, 1996, *Model Toxic Control Act Cleanup Levels and Risk Calculations (CLARC II),* Publication #94-145, Washington State Department of Ecology, Olympia, Washington.
8) Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
9) EPA, 1989, *Risk Assessment Guidance for Superfund* (RAGS), Volume I - Human Health Evaluation Manual (HHEM) (Part A Baseline Risk Assessment), Interim Final, Office of Emergency and Remedial Response, EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D.C.
10) EPA, 1994, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540/R-94/013. U.S. Environmental Protection Agency, Washington, D. C.
11) 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 2009). 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 UPR-300-38, 313 ESSP, and 300-270 waste sites. 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 2009) is documented by this calculation. Duplicate and split RPD results are used in evaluation of data quality within the RSVP for these sites.

Methodology:
The UPR-300-38, 313 ESSP, and 300-270 waste sites consists of one desicion unit with twelve statistical samples. Also included are fourteen focused sample with a duplicate sample and a split sample. Analytical data for all sampling locations is provided in the summary tables on sheets 3 & 4.

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 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). 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 2009) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting data set treated as uncensored.

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

The WAC 173-340-740(7)(e) 3-part test is not performed for COPCs where the statistical value defaults to the maximum value in the data set. Instead, direct comparison of the maximum value against site remedial action goals (RAGs) (within the RSVP) is used as the compliance basis.

The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table II-1 of the SAP (DOE-RL 2011) for certain constituents with cleanup levels or shown in laboratory-specific documents; all other constituents will have their own pre-determined TDL's based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate/split sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate/split results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Regulatory split samples were collected for cleanup verification of the subject site. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator N. K. Schiffern **Date** 02/27/12 **Calc. No.** 0300X-CA-V0152 **Rev. No.** 0
Project 300 Area Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 02/27/12
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations **Sheet No.** 3 of 17

Summary (continued)

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

Results Summary - Statistical Samples

Analyte	95% UCL Result	Maximum Result	Units
Bismuth-214	0.544	-	pCi/g
Lead-212	0.830	-	pCi/g
Uranium-238 GEA	3.45	-	pCi/g
Uranium-233/234 AEA	1.54	-	pCi/g
Uranium-238 AEA	1.68	-	pCi/g
Total beta radiostrontium GPC	1.04	-	pCi/g
Arsenic	3.51	-	mg/kg
Barium	79.4	-	mg/kg
Beryllium	0.326	-	mg/kg
Boron	1.02	-	mg/kg
Cadmium	0.124	-	mg/kg
Chromium	11.4	-	mg/kg
Cobalt	7.18	-	mg/kg
Copper	24.6	-	mg/kg
Lead	4.88	-	mg/kg
Lithium	8.54	-	mg/kg
Manganese	344	-	mg/kg
Mercury	-	0.0210	mg/kg
Molybdenum	0.396	-	mg/kg
Nickel	14.2	-	mg/kg
Vanadium	65.9	-	mg/kg
Zinc	52.5	-	mg/kg
Chloride	27.9	-	mg/kg
Fluoride	-	1.2	mg/kg
Nitrate	16.1	-	mg/kg
Nitrogen in Nitrite and Nitrate	3.71	-	mg/kg
Sulfate	18.7	-	mg/kg
Aroclor-1254	-	25.5	ug/kg
Aroclor-1260	-	12.9	ug/kg
Acetone	-	7.43	ug/kg
Methylene chloride	-	2.45	ug/kg

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

WAC 173-340 3-Part Test for most stringent RAG:

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

Results Summary - Focused Samples

Analyte	Maximum Result	Units
Bismuth-214	0.850	pCi/g
Cesium-137	0.312	pCi/g
Lead-212	1.08	pCi/g
Uranium-235 GEA	3.69	pCi/g
Uranium-238 GEA	76.2	pCi/g
Uranium-233/234 AEA	121	pCi/g
Uranium-235 AEA	8.23	pCi/g
Uranium-238 AEA	116	pCi/g
Arsenic	12.5	mg/kg
Barium	96.3	mg/kg
Beryllium	0.335	mg/kg
Boron	1.58	mg/kg
Cadmium	0.483	mg/kg
Chromium	14.7	mg/kg
Cobalt	7.91	mg/kg
Copper	91.3	mg/kg
Lead	76.7	mg/kg
Lithium	12.4	mg/kg
Manganese	397	mg/kg
Mercury	0.140	mg/kg
Molybdenum	0.996	mg/kg
Nickel	17.6	mg/kg
Uranium	449	mg/kg
Vanadium	85.8	mg/kg
Zinc	210	mg/kg
Chloride	296	mg/kg
Fluoride	9.8	mg/kg
Nitrate	742	mg/kg
Nitrogen in Nitrite and Nitrate	173	mg/kg
Sulfate	933	mg/kg
Aroclor-1248	35.8	ug/kg
Aroclor-1254	735	ug/kg
Aroclor-1260	209	ug/kg
Acetone	5.54	ug/kg

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

B = blank contamination (inorganic constituents)
D = dilution
DE = direct exposure
GW = groundwater
J = estimate
MDA = minimum detectable activity
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
TPH = total petroleum hydrocarbons
U = undetected
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford **CALCULATION SHEET**

Originator N. K. Schiffern NS **Date** 03/29/12 **Calc. No.** 0300X-CA-V0152 **Rev. No.** 0
Project 300 Area Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie JS **Date** 03/29/12
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 17

Summary (continued)

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

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

Analyte	Duplicate Analysis		Split Analysis	
	Focus Area	Resampling at Focus Area	Focus Area	Resampling at Focus Area
Potassium-40	17.7%	30.9%		
Uranium-238	13.9%			
Uranium-233/234 AEA	34.6%		2.5%	
Uranium-238 AEA	34.2%			
Aluminum	12.0%		7.5%	
Barium	14.7%		10.9%	
Calcium	12.3%		18.7%	
Chromium	47.7%		8.6%	
Copper	149.1%		9.6%	
Iron	5.3%		3.2%	
Lead			36.5%	
Magnesium	25.5%		12.2%	
Manganese	22.2%		4.9%	
Silicon	5.6%		32.9%	
Sodium	16.2%			
Uranium	22.6%			
Vanadium	9.2%		17.9%	
Zinc	9.6%		5.1%	
Zirconium	2.6%		12.0%	
Chloride	136.9%			
Nitrate	144.3%			
Sulfate	110.0%			
Aroclor-1254			27.0%	
Aroclor-1260			44.9%	

[a]RPD listed where result produced, based on criteria. If RPD not required, no value is listed. The significance of the reported RPD values, including values greater than 30% (35% for regulatory split data), is addressed in the data quality assessment section of the CVP/RSVP.

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffem NKS
Project 300 Area Field Remediation
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations

Date 02/27/12
Job No. 14655

Calc. No. 0300X-CA-V0152
Checked J. D. Skoglie

Rev. No. 0
Date 02/27/12
Sheet No. 5 of 17

1 UPR-300-38, 313 ESSP, and 300-270 Statistical Calculations
2 Verification Data -Statistical

3	Sample	Sample	Sample	Bismuth-214			Lead-212			Uranium-238			Uranium-233/234 AEA			Uranium-238 AEA			Total beta radiostrontium GPC		
4	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
5	VSP-1	J1N0C9	12/16/2011	0.426		0.041	0.802		0.049	2.77	U	2.77	1.42		0.187	1.30		0.187	0.044	U	0.310
6	VSP-2	J1N0F3	12/16/2011	0.670		0.073	1.06		0.055	7.57		4.15	2.11		0.185	1.98		0.185	0.085	U	0.320
7	VSP-3	J1N0D2	12/16/2011	0.456		0.064	0.618		0.037	4.23	U	4.23	0.587		0.195	1.02		0.195	0.009	U	0.269
8	VSP-4	J1N0H2	12/19/2011	0.653		0.070	1.11		0.048	4.18	U	4.18	1.20		0.204	1.52		0.204	0.138	U	0.308
9	VSP-5	J1N0F9	12/16/2011	0.415		0.052	0.514		0.030	3.39	U	3.39	0.820		0.224	0.761		0.224	-0.174	U	0.388
10	VSP-6	J1N0H0	12/19/2011	0.496		0.061	0.785		0.061	3.56	U	3.56	1.17		0.203	1.52		0.203	-0.075	U	0.313
11	VSP-7	J1N0F5	12/16/2011	0.518		0.069	0.803		0.041	3.90	U	3.90	2.48		0.202	3.03		0.202	0.115	U	0.305
12	VSP-8	J1N0F4	12/16/2011	0.462		0.063	0.680		0.036	4.26	U	4.26	1.62		0.217	1.59		0.217	-0.056	U	0.306
13	VSP-9	J1N0F6	12/16/2011	0.424		0.019	0.564		0.012	1.60	U	1.60	1.22		0.248	1.22		0.198	0.333	U	0.352
14	VSP-10	J1N0F7	12/16/2011	0.387		0.133	0.578		0.155	8.27	U	8.27	0.394		0.274	0.322		0.274	4.54		0.297
15	VSP-11	J1N0H4	12/19/2011	0.609		0.056	0.793		0.038	3.98	U	3.98	1.24		0.193	1.16		0.193	-0.036	U	0.317
16	VSP-12	J1N0F2	12/16/2011	0.467		0.132	0.545		0.094	6.99	U	6.99	0.822		0.242	0.759		0.242	0.120	U	0.321

17
18 Statistical Computation Input Data

19	Sample	Sample	Sample	Bismuth-214	Lead-212	Uranium-238	Uranium-233/234 AEA	Uranium-238 AEA	Total beta radiostrontium GPC
20	Area	Number	Date	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
21	VSP-1	J1N0C9	12/16/2011	0.426	0.802	1.39	1.42	1.30	0.044
22	VSP-2	J1N0F3	12/16/2011	0.670	1.06	7.57	2.11	1.98	0.085
23	VSP-3	J1N0D2	12/16/2011	0.456	0.618	2.12	0.587	1.02	0.009
24	VSP-4	J1N0H2	12/19/2011	0.653	1.11	2.09	1.20	1.52	0.138
25	VSP-5	J1N0F9	12/16/2011	0.415	0.514	1.70	0.820	0.761	-0.174
26	VSP-6	J1N0H0	12/19/2011	0.496	0.785	1.78	1.17	1.52	-0.075
27	VSP-7	J1N0F5	12/16/2011	0.518	0.803	1.95	2.48	3.03	0.115
28	VSP-8	J1N0F4	12/16/2011	0.462	0.680	2.13	1.62	1.59	-0.056
29	VSP-9	J1N0F6	12/16/2011	0.424	0.564	0.800	1.22	1.22	0.333
30	VSP-10	J1N0F7	12/16/2011	0.387	0.578	4.14	0.394	0.322	4.54
31	VSP-11	J1N0H4	12/19/2011	0.609	0.793	1.99	1.24	1.16	-0.036
32	VSP-12	J1N0F2	12/16/2011	0.467	0.545	3.50	0.822	0.759	0.120

33 Statistical Computations

34		Bismuth-214	Lead-212	Uranium-238	Uranium-233/234 AEA	Uranium-238 AEA	Total beta radiostrontium GPC
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.	Radionuclide data set. Use nonparametric z-statistic.
36	N	12	12	12	12	12	12
37	% < Detection limit	0%	0%	83%	0%	0%	83%
38	Mean	0.499	0.738	2.59	1.26	1.35	0.420
39	Standard deviation	0.0955	0.195	1.80	0.601	0.691	1.30
40	Z-statistic	1.64	1.64	1.64	1.64	1.64	1.64
41	95% UCL on mean	0.544	0.830	3.45	1.54	1.68	1.04
42	Maximum value	0.670	1.110	8.27	2.48	3.03	4.54

43

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NS
Project 300 Area Field Remediation
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations

Date 02/27/12
Job No. 14655

Calc. No. 0300X-CA-V0152
Checked J. D. Skoglie JS

Rev. No. 0
Date 02/27/12
Sheet No. 6 of 17

1 UPR-300-38, 313 ESSP, and 300-270 Statistical Calculations
2 Verification Data Statistical

	Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Lead mg/kg	Q	PQL
3																														
4																														
5	VSP-1	J1N0C9	12/16/2011	2.75		0.771	72.8		0.386	0.285		0.154	0.813	B	1.54	0.0935	B	0.154	8.24		0.154	5.79		1.54	10.0		0.771	3.94		0.386
6	VSP-2	J1N0F3	12/16/2011	4.20		0.812	51.8		0.406	0.350		0.162	0.921	B	1.62	0.114	B	0.162	11.5		0.162	7.48		1.62	16.7		0.812	4.04		0.406
7	VSP-3	J1N0D2	12/16/2011	2.35		0.804	82.0		0.402	0.315		0.161	0.641	B	1.61	0.107	B	0.161	8.77		0.161	6.91		1.61	15.0		0.804	3.46		0.402
8	VSP-4	J1N0H2	12/19/2011	3.37		0.827	86.1		0.413	0.254		0.165	0.782	B	1.65	0.0930	B	0.165	9.19		0.165	6.24		1.65	11.0		0.827	3.68		0.413
9	VSP-5	J1N0F9	12/16/2011	4.00		0.766	74.1		0.383	0.299		0.153	0.931	B	1.53	0.124	B	0.153	12.4		0.153	8.07		1.53	16.3		0.766	4.21		0.383
10	VSP-6	J1N0H0	12/19/2011	3.23		0.792	62.8		0.396	0.271		0.158	0.996	B	1.58	0.0928	B	0.158	14.7		0.158	7.00		1.58	18.0		0.792	3.68		0.396
11	VSP-7	J1N0F5	12/16/2011	3.14		0.846	77.1		0.423	0.298		0.169	1.41	B	1.69	0.192		0.169	10.7		0.169	6.14		1.69	15.2		0.846	4.81		0.423
12	VSP-8	J1N0F4	12/16/2011	3.08		0.651	73.3		0.325	0.324		0.130	0.835	B	1.30	0.107	B	0.130	9.43		0.130	6.48		1.30	60.7		0.651	8.07		0.325
13	VSP-9	J1N0F6	12/16/2011	2.57		0.651	69.6		0.325	0.264		0.130	0.703	B	1.30	0.0873	B	0.130	9.19		0.130	5.27		1.30	10.8		0.651	3.25		0.325
14	VSP-10	J1N0F7	12/16/2011	2.26		0.697	64.3		0.349	0.276		0.139	0.824	B	1.39	0.0923	B	0.139	7.45		0.139	5.63		1.39	10.7		0.697	3.19		0.349
15	VSP-11	J1N0H4	12/19/2011	3.26		0.929	82.6		0.464	0.283		0.186	1.18	B	1.86	0.111	B	0.186	12.2		0.186	6.89		1.86	13.5		0.929	4.17		0.464
16	VSP-12	J1N0F2	12/16/2011	3.58		0.788	82.3		0.394	0.415		0.158	0.794	B	1.58	0.115	B	0.158	7.71		0.158	8.08		1.58	18.7		0.788	4.67		0.394

17
18 Statistical Computation nput 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
19												
20												
21	VSP-1	J1N0C9	12/16/2011	2.75	72.8	0.285	0.813	0.0935	8.24	5.79	10.0	3.94
22	VSP-2	J1N0F3	12/16/2011	4.20	51.8	0.350	0.921	0.114	11.5	7.48	16.7	4.04
23	VSP-3	J1N0D2	12/16/2011	2.35	82.0	0.315	0.641	0.107	8.77	6.91	15.0	3.46
24	VSP-4	J1N0H2	12/19/2011	3.37	86.1	0.254	0.782	0.0930	9.19	6.24	11.0	3.68
25	VSP-5	J1N0F9	12/16/2011	4.00	74.1	0.299	0.931	0.124	12.4	8.07	16.3	4.21
26	VSP-6	J1N0H0	12/19/2011	3.23	62.8	0.271	0.996	0.0928	14.7	7.00	18.0	3.68
27	VSP-7	J1N0F5	12/16/2011	3.14	77.1	0.298	1.41	0.192	10.7	6.14	15.2	4.81
28	VSP-8	J1N0F4	12/16/2011	3.08	73.3	0.324	0.835	0.107	9.43	6.48	60.7	8.07
29	VSP-9	J1N0F6	12/16/2011	2.57	69.6	0.264	0.703	0.0873	9.19	5.27	10.8	3.25
30	VSP-10	J1N0F7	12/16/2011	2.26	64.3	0.276	0.824	0.0923	7.45	5.63	10.7	3.19
31	VSP-11	J1N0H4	12/19/2011	3.26	82.6	0.283	1.18	0.111	12.2	6.89	13.5	4.17
32	VSP-12	J1N0F2	12/16/2011	3.58	82.3	0.415	0.794	0.115	7.71	8.08	18.7	4.67

33 Statistical Computations

		Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Lead
34										
35	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%
38	mean	3.15	73.2	0.303	0.903	0.111	10.1	6.67	18.1	4.26
39	st. dev.	0.604	10.0	0.0445	0.213	0.0281	2.20	0.911	13.8	1.30
40	95% UCL on mean	3.51	79.4	0.326	1.02	0.124	11.4	7.18	24.6	4.88
41	max value	4.20	86.1	0.415	1.41	0.192	14.7	8.08	60.7	8.07
42	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	353 DE Protection
43	WAC 173-340 3-PART TEST									
44	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	YES	NA
45	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NA
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	YES	NA
47	WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (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.	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 (353 mg/kg) the WAC 173-340 3-part test is not required.

48

CALCULATION SHEET

Washington Closure Hanford

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1 UPR-300-38, 313 ESSP, and 300-270 Statistical Calculations
2 Verification Data -Statistical

3 Sample	Sample	Sample	Lithium			Manganese			Molybdenum			Nickel			Vanadium			Zinc			Chloride			Nitrate			Nitrogen in Nitrite and Nitrate		
4 Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5 VSP-1	J1N0C9	12/16/2011	6.81		1.93	307		3.86	0.268	B	1.54	8.14		3.08	47.5		1.93	37.1		7.71	1.2	B	5.0	2.4	BJ	5.0	0.67		0.50
6 VSP-2	J1N0F3	12/16/2011	8.83		2.03	351		4.06	0.335	B	1.62	12.7		3.25	69.2		2.03	47.6		8.12	31.2		4.8	49.4	J	4.8	11.3	D	0.97
7 VSP-3	J1N0D2	12/16/2011	6.35		2.01	315		4.02	0.333	B	1.61	11.2		3.22	63.5		2.01	42.5		8.04	1.1	B	4.5	3.2	BJ	4.5	0.76		0.45
8 VSP-4	J1N0H2	12/19/2011	8.54		2.07	334		4.13	0.307	B	1.65	9.45		3.31	59.5		2.07	41.4		8.27	2.8	B	4.7	7.9		4.7	1.95		0.47
9 VSP-5	J1N0F9	12/16/2011	9.91		1.91	399		3.83	0.459	B	1.53	16.8		3.06	71.6		1.91	49.3		7.66	1.6	B	5.0	8.7		5.0	2.08		0.50
10 VSP-6	J1N0H0	12/19/2011	8.70		1.98	323		3.96	0.363	B	1.58	23.4		3.17	62.8		1.98	42.5		7.92	1.2	B	4.8	7.9		4.8	1.9		0.48
11 VSP-7	J1N0F5	12/16/2011	8.07		2.12	289		4.23	0.320	B	1.69	9.15		3.38	54.3		2.12	81.6		8.46	1.0	B	4.7	4.2	BJ	4.7	0.98		0.47
12 VSP-8	J1N0F4	12/16/2011	7.55		1.63	307		3.25	0.379	B	1.30	9.43		2.60	55.8		1.63	44.0		6.51	3.3	B	4.9	9.7	J	4.9	2.22		0.49
13 VSP-9	J1N0F6	12/16/2011	6.83		1.63	281		3.25	0.428	B	1.30	13.0		2.60	47.0		1.63	37.1		6.51	4.7	U	4.7	4.7	UR	4.7	0.14	BJ	0.47
14 VSP-10	J1N0F7	12/16/2011	6.27		1.74	265		3.49	0.267	B	1.39	7.43		2.79	52.3		1.74	38.4		6.97	2.9	B	4.8	7.2	J	4.8	1.64		0.48
15 VSP-11	J1N0H4	12/19/2011	8.18		2.32	355		4.64	0.420	B	1.86	11.1		3.71	62.6		2.32	44.2		9.29	1.3	B	4.8	10.6		4.8	2.57		0.48
16 VSP-12	J1N0F2	12/16/2011	8.59		1.97	351		3.94	0.415	B	1.58	9.49		3.15	78.4		1.97	55.0		7.88	108	D	10.0	7.3	J	5.0	1.67		0.50

17
18 Statistical Computation Input Data

19 Sample	Sample	Sample	Lithium	Manganese	Molybdenum	Nickel	Vanadium	Zinc	Chloride	Nitrate	Nitrogen in Nitrite and Nitrate
20 Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21 VSP-1	J1N0C9	12/16/2011	6.81	307	0.268	8.14	47.5	37.1	1.2	2.4	0.67
22 VSP-2	J1N0F3	12/16/2011	8.83	351	0.335	12.7	69.2	47.6	31.2	49.4	11.3
23 VSP-3	J1N0D2	12/16/2011	6.35	315	0.333	11.2	63.5	42.5	1.1	3.2	0.76
24 VSP-4	J1N0H2	12/19/2011	8.54	334	0.307	9.45	59.5	41.4	2.8	7.9	1.95
25 VSP-5	J1N0F9	12/16/2011	9.91	399	0.459	16.8	71.6	49.3	1.6	8.7	2.08
26 VSP-6	J1N0H0	12/19/2011	8.70	323	0.363	23.4	62.8	42.5	1.2	7.9	1.9
27 VSP-7	J1N0F5	12/16/2011	8.07	289	0.320	9.15	54.3	81.6	1.0	4.2	0.98
28 VSP-8	J1N0F4	12/16/2011	7.55	307	0.379	9.43	55.8	44.0	3.3	9.7	2.22
29 VSP-9	J1N0F6	12/16/2011	6.83	281	0.428	13.0	47.0	37.1	2.4	2.4	0.14
30 VSP-10	J1N0F7	12/16/2011	6.27	265	0.267	7.43	52.3	38.4	2.9	7.2	1.64
31 VSP-11	J1N0H4	12/19/2011	8.18	355	0.420	11.1	62.6	44.2	1.3	10.6	2.57
32 VSP-12	J1N0F2	12/16/2011	8.59	351	0.415	9.49	78.4	55.0	108	7.3	1.67

33 Statistical Computations

34	Lithium	Manganese	Molybdenum	Nickel	Vanadium	Zinc	Chloride	Nitrate	Nitrogen in Nitrite and Nitrate
35 95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), 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.
36 N	12	12	12	12	12	12	12	12	12
37 % < Detection limit	0%	0%	0%	0%	0%	0%	8%	8%	0%
38 mean	7.89	323	0.358	11.8	60.4	46.7	13.2	10.1	2.32
39 st. dev.	1.13	37.4	0.0634	4.46	9.62	12.2	31.0	12.7	2.92
40 95% UCL on mean	8.54	344	0.396	14.2	65.9	52.5	27.9	16.1	3.71
41 max value	9.91	399	0.459	23.4	78.4	81.6	108	49.4	11.3
42 Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	33.5 GW Protection	512 GW Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	1000 GW Protection
43 WAC 173-340 3-PART TEST									
44 95% UCL > Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO	NO	NA
45 > 10% above Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO	NO	NA
46 Any sample > 2X Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO	NO	NA
47 WAC 173-340 Compliance?	Because all values are below background (33.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.

48

Washington Closure Hanfo rd

CALCULATION SHEET

Originator N. K. Schiffern
Project 300 Area Field Remediation
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations

Date 02/27/12
Job No. 14655

Calc. No. 0300X-CA-V0152
Checked J. D. Skoglie

Rev. No. 0
Date 02/27/12
Sheet No. 8 of 17

UPR-300-38, 313 ESSP, and 300-270 Statistical Calculations

Verification Data -Statistical

Sample Area	Sample Number	Sam le Date	Sulfate m g/k	Q	PQL
VSP-1	J1N0C9	12/16/2011	3.0	BUJ	5.0
VSP-2	J1N0F3	12/16/2011	58.7	J	4.8
VSP-3	J1N0D2	12/16/2011	3.0	BUJ	4.5
VSP-4	J1N0H2	12/19/2011	7.9		4.7
VSP-5	J1N0F9	12/16/2011	8.5		5.0
VSP-6	J1N0H0	12/19/2011	11.9		4.8
VSP-7	J1N0F5	12/16/2011	8.2	UR	4.7
VSP-8	J1N0F4	12/16/2011	10.7	UJ	4.9
VSP-9	J1N0F6	12/16/2011	5.1	UJ	4.7
VSP-10	J1N0F7	12/16/2011	10.9	UJ	4.8
VSP-11	J1N0H4	12/19/2011	8.7		4.8
VSP-12	J1N0F2	12/16/2011	22.3	J	5.0

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Sulfate m g/kg
VSP-1	J1N0C9	12/16/2011	2.5
VSP-2	J1N0F3	12/16/2011	58.7
VSP-3	J1N0D2	12/16/2011	2.3
VSP-4	J1N0H2	12/19/2011	7.9
VSP-5	J1N0F9	12/16/2011	8.5
VSP-6	J1N0H0	12/19/2011	11.9
VSP-7	J1N0F5	12/16/2011	2.4
VSP-8	J1N0F4	12/16/2011	2.5
VSP-9	J1N0F6	12/16/2011	2.4
VSP-10	J1N0F7	12/16/2011	2.4
VSP-11	J1N0H4	12/19/2011	8.7
VSP-12	J1N0F2	12/16/2011	22.3

Statistical Computations

	Sulfate
95% UCL based on	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
N	12
% < Detection limit	42%
mean	11.0
st. dev.	16.2
95% UCL on mean	18.7
max value	58.7
Most Stringent Cleanup Limit fo nonradionuclide and RAG typ (mg/kg)	25000 GW Protection
WAC 173-340 3-PART TEST	
95% UCL > Cleanup Limit?	NA
> 10% above Cleanup Limit?	NA
Any sample > 2X Cleanu Limit?	NA
WAC 173-340 Compliance?	Because all values are below background (237 mg/kg) the WAC 173-340 3-art test is not r uired.

CALCULATION SHEET

Washington Closure Hanford

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Calc. No. 0300X-CA-V0152
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Rev. No. 0
Date 02/27/12
Sheet No. 9 of 17

Ecology Software (MTCAStat) Results, UPR-300-38, 313 ESSP, and 300-270 Statistical Samples

Arsenic 95% UCL Calculation

DATA	ID
2.75	J1N0C9
4.20	J1N0F3
2.35	J1N0D2
3.37	J1N0H2
4.00	J1N0F9
3.23	J1N0H0
3.14	J1N0F5
3.08	J1N0F4
2.57	J1N0F6
2.26	J1N0F7
3.26	J1N0H4
3.58	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	3.15
Censored		Lognormal mean	3.15
Detection limit or PQL		Std. devn.	0.604
Method detection limit		Median	3.19
TOTAL	12	Min.	2.26
		Max.	4.20

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

UCL (Land's method) is 3.51

Barium 95% UCL Calculation

DATA	ID
72.8	J1N0C9
51.8	J1N0F3
82.0	J1N0D2
86.1	J1N0H2
74.1	J1N0F9
62.8	J1N0H0
77.1	J1N0F5
73.3	J1N0F4
69.6	J1N0F6
64.3	J1N0F7
82.6	J1N0H4
82.3	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	73.2
Censored		Lognormal mean	73.3
Detection limit or PQL		Std. devn.	10.0
Method detection limit		Median	73.7
TOTAL	12	Min.	51.8
		Max.	86.1

Lognormal distribution? r-squared is: 0.904
Normal distribution? r-squared is: 0.938
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 79.4

Beryllium 95% UCL Calculation

DATA	ID
0.285	J1N0C9
0.350	J1N0F3
0.315	J1N0D2
0.254	J1N0H2
0.299	J1N0F9
0.271	J1N0H0
0.298	J1N0F5
0.324	J1N0F4
0.264	J1N0F6
0.276	J1N0F7
0.283	J1N0H4
0.415	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.303
Censored		Lognormal mean	0.303
Detection limit or PQL		Std. devn.	0.044
Method detection limit		Median	0.292
TOTAL	12	Min.	0.254
		Max.	0.415

Lognormal distribution? r-squared is: 0.903
Normal distribution? r-squared is: 0.853
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.326

Boron 95% UCL Calculation

DATA	ID
0.813	J1N0C9
0.921	J1N0F3
0.641	J1N0D2
0.782	J1N0H2
0.931	J1N0F9
0.996	J1N0H0
1.41	J1N0F5
0.835	J1N0F4
0.703	J1N0F6
0.824	J1N0F7
1.18	J1N0H4
0.794	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.903
Censored		Lognormal mean	0.903
Detection limit or PQL		Std. devn.	0.213
Method detection limit		Median	0.830
TOTAL	12	Min.	0.641
		Max.	1.41

Lognormal distribution? r-squared is: 0.933
Normal distribution? r-squared is: 0.869
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.02

Cadmium 95% UCL Calculation

DATA	ID
0.0935	J1N0C9
0.114	J1N0F3
0.107	J1N0D2
0.0930	J1N0H2
0.124	J1N0F9
0.0928	J1N0H0
0.192	J1N0F5
0.107	J1N0F4
0.0873	J1N0F6
0.0923	J1N0F7
0.111	J1N0H4
0.115	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.111
Censored		Lognormal mean	0.111
Detection limit or PQL		Std. devn.	0.0281
Method detection limit		Median	0.107
TOTAL	12	Min.	0.087
		Max.	0.192

Lognormal distribution? r-squared is: 0.780
Normal distribution? r-squared is: 0.678
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.124

Chromium 95% UCL Calculation

DATA	ID
8.24	J1N0C9
11.5	J1N0F3
8.77	J1N0D2
9.19	J1N0H2
12.4	J1N0F9
14.7	J1N0H0
10.7	J1N0F5
9.43	J1N0F4
9.19	J1N0F6
7.45	J1N0F7
12.2	J1N0H4
7.71	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	10.1
Censored		Lognormal mean	10.1
Detection limit or PQL		Std. devn.	2.20
Method detection limit		Median	9.31
TOTAL	12	Min.	7.45
		Max.	14.7

Lognormal distribution? r-squared is: 0.964
Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.4

Cobalt 95% UCL Calculation

DATA	ID
5.79	J1N0C9
7.48	J1N0F3
6.91	J1N0D2
6.24	J1N0H2
8.07	J1N0F9
7.00	J1N0H0
6.14	J1N0F5
6.48	J1N0F4
5.27	J1N0F6
5.63	J1N0F7
6.89	J1N0H4
8.08	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	6.67
Censored		Lognormal mean	6.67
Detection limit or PQL		Std. devn.	0.911
Method detection limit		Median	6.69
TOTAL	12	Min.	5.27
		Max.	8.08

Lognormal distribution? r-squared is: 0.978
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.18

Copper 95% UCL Calculation

DATA	ID
10.0	J1N0C9
16.7	J1N0F3
15.0	J1N0D2
11.0	J1N0H2
16.3	J1N0F9
18.0	J1N0H0
15.2	J1N0F5
60.7	J1N0F4
10.8	J1N0F6
10.7	J1N0F7
13.5	J1N0H4
18.7	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	18.1
Censored		Lognormal mean	17.6
Detection limit or PQL		Std. devn.	13.8
Method detection limit		Median	15.1
TOTAL	12	Min.	10.0
		Max.	60.7

Lognormal distribution? r-squared is: 0.727
Normal distribution? r-squared is: 0.500
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 24.6

Lead 95% UCL Calculation

DATA	ID
3.94	J1N0C9
4.04	J1N0F3
3.46	J1N0D2
3.68	J1N0H2
4.21	J1N0F9
3.68	J1N0H0
4.81	J1N0F5
8.07	J1N0F4
3.25	J1N0F6
3.19	J1N0F7
4.17	J1N0H4
4.67	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	4.26
Censored		Lognormal mean	4.26
Detection limit or PQL		Std. devn.	1.30
Method detection limit		Median	3.99
TOTAL	12	Min.	3.19
		Max.	8.07

Lognormal distribution? r-squared is: 0.801
Normal distribution? r-squared is: 0.673
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.88

CALCULATION SHEET

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Calc. No. 0300X-CA-V0152
Checked J. D. Skoglie

Rev. No. 0
Date 02/27/12
Sheet No. 10 of 17

Ecology Software (MTCAStat) Results, UPR-300-38, 313 ESSP, and 300-270 Statistical Samples

Lithium 95% UCL Calculation

DATA	ID
6.81	J1N0C9
8.83	J1N0F3
6.35	J1N0D2
8.54	J1N0H2
9.91	J1N0F9
8.70	J1N0H0
8.07	J1N0F5
7.55	J1N0F4
6.83	J1N0F6
6.27	J1N0F7
8.18	J1N0H4
8.59	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	7.89
Censored		Lognormal mean	7.89
Detection limit or PQL		Std. devn.	1.13
Method detection limit		Median	8.13
TOTAL	12	Min.	6.27
		Max.	9.91

Lognormal distribution? r-squared is: 0.944
Normal distribution? r-squared is: 0.949
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.54

Manganese 95% UCL Calculation

DATA	ID
307	J1N0C9
351	J1N0F3
315	J1N0D2
334	J1N0H2
399	J1N0F9
323	J1N0H0
289	J1N0F5
307	J1N0F4
281	J1N0F6
265	J1N0F7
355	J1N0H4
351	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	323
Censored		Lognormal mean	323
Detection limit or PQL		Std. devn.	37.4
Method detection limit		Median	319
TOTAL	12	Min.	265
		Max.	399

Lognormal distribution? r-squared is: 0.980
Normal distribution? r-squared is: 0.970
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 344

Molybdenum 95% UCL Calculation

DATA	ID
0.268	J1N0C9
0.335	J1N0F3
0.333	J1N0D2
0.307	J1N0H2
0.459	J1N0F9
0.363	J1N0H0
0.320	J1N0F5
0.379	J1N0F4
0.428	J1N0F6
0.267	J1N0F7
0.420	J1N0H4
0.415	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.358
Censored		Lognormal mean	0.358
Detection limit or PQL		Std. devn.	0.063
Method detection limit		Median	0.349
TOTAL	12	Min.	0.267
		Max.	0.459

Lognormal distribution? r-squared is: 0.963
Normal distribution? r-squared is: 0.967
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.396

Nickel 95% UCL Calculation

DATA	ID
8.14	J1N0C9
12.7	J1N0F3
11.2	J1N0D2
9.45	J1N0H2
16.8	J1N0F9
23.4	J1N0H0
9.15	J1N0F5
9.43	J1N0F4
13.0	J1N0F6
7.43	J1N0F7
11.1	J1N0H4
9.49	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	11.8
Censored		Lognormal mean	11.8
Detection limit or PQL		Std. devn.	4.46
Method detection limit		Median	10.3
TOTAL	12	Min.	7.43
		Max.	23.4

Lognormal distribution? r-squared is: 0.902
Normal distribution? r-squared is: 0.789
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.2

Vanadium 95% UCL Calculation

DATA	ID
47.5	J1N0C9
69.2	J1N0F3
63.5	J1N0D2
59.5	J1N0H2
71.6	J1N0F9
62.8	J1N0H0
54.3	J1N0F5
55.8	J1N0F4
47.0	J1N0F6
52.3	J1N0F7
62.6	J1N0H4
78.4	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	60.4
Censored		Lognormal mean	60.4
Detection limit or PQL		Std. devn.	9.62
Method detection limit		Median	61.1
TOTAL	12	Min.	47.0
		Max.	78.4

Lognormal distribution? r-squared is: 0.981
Normal distribution? r-squared is: 0.975
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 65.9

Zinc 95% UCL Calculation

DATA	ID
37.1	J1N0C9
47.6	J1N0F3
42.5	J1N0D2
41.4	J1N0H2
49.3	J1N0F9
42.5	J1N0H0
81.6	J1N0F5
44.0	J1N0F4
37.1	J1N0F6
38.4	J1N0F7
44.2	J1N0H4
55.0	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	46.7
Censored		Lognormal mean	46.7
Detection limit or PQL		Std. devn.	12.2
Method detection limit		Median	43.3
TOTAL	12	Min.	37.1
		Max.	81.6

Lognormal distribution? r-squared is: 0.795
Normal distribution? r-squared is: 0.692
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 52.5

Chloride 95% UCL Calculation

DATA	ID
1.2	J1N0C9
31.2	J1N0F3
1.1	J1N0D2
2.8	J1N0H2
1.6	J1N0F9
1.2	J1N0H0
1.0	J1N0F5
3.3	J1N0F4
2.4	J1N0F6
2.9	J1N0F7
1.3	J1N0H4
108	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	13.2
Censored		Lognormal mean	8.9
Detection limit or PQL		Std. devn.	31.0
Method detection limit		Median	2.0
TOTAL	12	Min.	1.0
		Max.	108

Lognormal distribution? r-squared is: 0.725
Normal distribution? r-squared is: 0.428
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 27.9

Nitrate 95% UCL Calculation

DATA	ID
2.4	J1N0C9
49.4	J1N0F3
3.2	J1N0D2
7.9	J1N0H2
8.7	J1N0F9
7.9	J1N0H0
4.2	J1N0F5
9.7	J1N0F4
2.4	J1N0F6
7.2	J1N0F7
10.6	J1N0H4
7.3	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	10.1
Censored		Lognormal mean	9.6
Detection limit or PQL		Std. devn.	12.7
Method detection limit		Median	7.6
TOTAL	12	Min.	2.4
		Max.	49.4

Lognormal distribution? r-squared is: 0.865
Normal distribution? r-squared is: 0.503
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 16.1

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
0.67	J1N0C9
11.3	J1N0F3
0.76	J1N0D2
1.95	J1N0H2
2.08	J1N0F9
1.9	J1N0H0
0.98	J1N0F5
2.22	J1N0F4
0.14	J1N0F6
1.64	J1N0F7
2.57	J1N0H4
1.67	J1N0F2

Number of samples		Uncensored values	
Uncensored	12	Mean	2.32
Censored		Lognormal mean	2.49
Detection limit or PQL		Std. devn.	2.92
Method detection limit		Median	1.79
TOTAL	12	Min.	0.14
		Max.	11.3

Lognormal distribution? r-squared is: 0.866
Normal distribution? r-squared is: 0.534
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.71

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NS **Date** 02/27/12 **Calc. No.** 0300X-CA-V0152 **Rev. No.** 0

Project 300 Area Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 02/27/12

Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations **Sheet No.** 11 of 17

Ecology Software (MTCAStat) Results, UPR-300-38, 313 ESSP, and 300-270 Statistical Samples

Sulfate 95% UCL Calculation

	DATA	ID				
1	2.5	J1N0C9				
2	58.7	J1N0F3				
3	2.3	J1N0D2	Number of samples		Uncensored values	
4	7.9	J1N0H2	Uncensored	12	Mean	11.0
5	8.5	J1N0F9	Censored		Lognormal mean	10.5
6	11.9	J1N0H0	Detection limit or PQL		Std. devn.	16.2
7	2.4	J1N0F5	Method detection limit		Median	5.2
8	2.5	J1N0F4	TOTAL	12	Min.	2.3
9	2.4	J1N0F6			Max.	58.7
10	2.4	J1N0F7				
11	8.7	J1N0H4				
12	22.3	J1N0F2				
13						
14						
15						
16						
17			Lognormal distribution?		Normal distribution?	
18			r-squared is: 0.839		r-squared is: 0.577	
19			Recommendations:			
20			Reject BOTH lognormal and normal distributions.			
21						
22			UCL (based on Z-statistic) is		18.7	
23						
24						

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffem — Date 02/27/12 — Calc. No. 0300X-CA-V0152 — Rev. No. 0

Project 300 Area Field Remediation — Job No. 14655 — Checked J. D. Skoglie — Date 02/27/12

Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations — Sheet No. 12 of 17

Duplicate Analysis - UPR-300-38, 313 ESSP, and 300-270 Focused Samples

Sampling Area	HEIS Number	Sample Date	Bismuth-214 pCi/g	Q	MDA	Lead-212 pCi/g	Q	MDA	Potassium-40 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA	Thorium-228 pCi/g	Q	MDA	Thorium-232 pCi/g	Q	MDA	Uranium-235 pCi/g	Q	MDA
FS-5	J1N0D8	12/16/2011	0.517		0.103	0.826		0.062	16.6		0.446	0.502		0.100	0.843		0.219	0.809		0.060	0.843		0.219	0.834		0.33
Duplicate of J1N0D8	J1N0F0	12/16/2011	0.483		0.059	0.716		0.046	13.9		0.392	0.469		0.057	0.567		0.13	0.701		0.046	0.567		0.13	0.717		0.244
Analysis:																										
TDL			0.25			0.25			0.5			0.1			0.2			1			1			1		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD								17.7%																	
	Difference > 2 TDL?		No - acceptable			No - acceptable			Yes - assess further			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Uranium-238 pCi/g	Q	MDA	Uranium-233/234 AEA pCi/g	Q	MDA	Uranium-235 AEA pCi/g	Q	MDA	Uranium-238 AEA pCi/g	Q	MDA	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL
FS-5	J1N0D8	12/16/2011	19.2		6.8	17.2		0.316	0.799	J	0.306	16.7		0.316	8220	J	4.64	2.93		0.928	87.5		0.464	0.312		0.186
Duplicate of J1N0D8	J1N0F0	12/16/2011	16.7		4.09	24.4		0.33	1.07		0.248	23.6		0.296	7290	J	4.02	3.21		0.805	75.5		0.402	0.298		0.161
Analysis:																										
TDL			1			1			1			1			5			10			2			0.5		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		13.9%			34.6%						34.2%			12.0%						14.7%					
	Difference > 2 TDL?		Yes - assess further			Yes - assess further			No - acceptable			Yes - assess further			Yes - assess further			No - acceptable			Yes - assess further			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL
FS-5	J1N0D8	12/16/2011	1.51	B	1.86	0.196		0.186	4670		92.8	12.7		0.186	6.32		1.86	91.3		0.928	19300		18.6	6.80		0.464
Duplicate of J1N0D8	J1N0F0	12/16/2011	1.17	B	1.61	0.168		0.161	5280		80.5	7.81		0.161	6.20		1.61	13.3		0.805	18300		16.1	8.36		0.402
Analysis:																										
TDL			2			0.5			100			1			2			1.0			5			5		
Duplicate Analysis	Both > PQL?		No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?					No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD								12.3%			47.7%						149.1%			5.3%					
	Difference > 2 TDL?		No - acceptable			No - acceptable			Yes - assess further			Yes - assess further			No - acceptable			Yes - assess further			Yes - assess further			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL
FS-5	J1N0D8	12/16/2011	7.34		2.32	4340		69.6	320		4.64	0.100		0.0255	0.560	B	1.86	11.4		3.71	1430		371	1280		1.86
Duplicate of J1N0D8	J1N0F0	12/16/2011	5.95		2.01	3360		60.4	256		4.02	0.135		0.0273	0.393	B	1.61	7.68		3.22	1310		322	1210		1.61
Analysis:																										
TDL			2.5			75			5			0.2			2			4			400			2		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)						No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)		
	RPD					25.5%			22.2%															5.6%		
	Difference > 2 TDL?		No - acceptable			Yes - assess further			Yes - assess further			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Yes - assess further		

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern — Date 03/29/12 — Calc. No. 0300X-CA-V0152 — Rev. No. 0
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Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations — Sheet No. 13 of 17

Duplicate Analysis - UPR-300-38, 313 ESSP, and 300-270 Focused Samples

Sampling Area	HEIS Number	Sample Date	Sodium			Uranium			Vanadium			Zinc			Zirconium			Chloride			Nitrate			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
FS-5	J1N0D8	12/16/2011	501		46.4	40.8		18.6	51.0		2.32	54.3		9.28	19.5		2.32	156	D	10.1	136	DJ	10.1	32.2	D	2.52
Duplicate of J1N0D8	J1N0F0	12/16/2011	426		40.2	51.2		16.1	46.5		2.01	59.8		8.05	19.0		2.01	29.2		4.6	22.0	J	4.6	5.04		0.46

Analysis:

TDL		50	1	2.5	1	2.5	2	2.5	2.5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)
	RPD	16.2%	22.6%	9.2%	9.6%	2.6%	*136.9%*	*144.3%*	
	Difference > 2 TDL?	No - acceptable	Yes - assess further	No - acceptable	Yes - assess further	No - acceptable	**Yes - assess further**	Yes - assess further	**Yes - assess further**

Sampling Area	HEIS Number	Sample Date	Sulfate			Aroclor-1254			Aroclor-1260		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
FS-5	J1N0D8	12/16/2011	183	DJ	10.1	26.0		13.3	27.8		13.3
Duplicate of J1N0D8	J1N0F0	12/16/2011	53.1	J	4.6	46.4		13.5	35.7		13.5

Analysis:

TDL		5	16.5	16.5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	*110.0%*		
	Difference > 2 TDL?	**Yes - assess further**	**No - acceptable**	**No - acceptable**

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffern NS — Date 02/27/12 — Calc. No. 0300X-CA-V0152.0 — Rev. No. 0

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Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations — Sheet No. 14 of 17

1	Duplicate Analysis - UPR-300-38		313 ESSP, and 300-270 Focused Samples																							
2	Sampling	HEIS	Sample	Bismuth-214			Lead-212			Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Uranium-233/234 AEA		
3	Area	Number	Date	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
4	FS-14 resample	J1N3H0	1/26/2012	0.280		0.128	0.414		0.084	10.3		0.380	0.272		0.124	0.454		0.226	0.401		0.081	0.454		0.226	0.950		0.130
5	Duplicate of J1N3H0	J1N3H1	1/26/2012	0.320		0.121	0.495		0.172	7.54		0.718	0.311		0.118	0.681		0.353	0.479		0.167	0.681		0.353	0.478		0.135
6	Analysis:																										
7	TDL			0.25			0.25			0.5			0.1			0.2			1			1			1		
8	Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
9		Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)		
10		RPD								30.9%																	
11		Difference > 2 TDL?		No - acceptable			No - acceptable			Yes - assess further			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		
12																											
13	Sampling	HEIS	Sample	Uranium-238 AEA																							
14	Area	Number	Date	pCi/g	Q	MDA																					
15	FS-14 resample	J1N3H0	1/26/2012	0.798		0.130																					
16	Duplicate of J1N3H0	J1N3H1	1/26/2012	0.495		0.135																					
17	Analys s:																										
18	TDL			1																							
19	Duplicate Analysis	Both > PQL?		Yes (continue)																							
20		Both >5xTDL?		No-Stop (acceptable)																							
21		RPD																									
22		Difference > 2 TDL?		No - acceptable																							
23																											
24																											

CALCULATION SHEET

Washington Closure Hanford

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Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations — Sheet No. 15 of 17

Split Analysis - UPR-300-38, 313 ESSP, and 300-270 Focused Samp es

Sampling Area	HEIS Number	Sample Date	Cesium-137 pCi/g	Q	MDA	Radium-226 pCi/g	Q	MDA	Radium-228 pCi/g	Q	MDA	Uranium-235 pCi/g	Q	MDA	Uranium-238 pCi/g	Q	MDA	Uranium-233/234 AEA pCi/g	Q	MDA	Uranium-235 AEA pCi/g	Q	MDA	Uranium-238 AEA pCi/g	Q	MDA
FS-1	J1N0H5	12/19/2011	0.233		0.034	0.438		0.056	0.729		0.112	0.402		0.215	4.98		3.66	12		0.105	1.21		0.031	1.21		0.031
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.312		0.0276	0.44		0.0461	0.729		0.0956	0.275		0.126	3.76		1.05	11.7		0.097	0.557		0.0870	0.557		0.087
Analysis:																										
TDL			0.1			0.1			0.2			1			1			1			1			1		
Split Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD																	2.5%								
	Difference > 2 TDL?		No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL
FS-1	J1N0H5	12/19/2011	7720		3.37	6.39		0.673	64.9		0.337	1.45		1.35	0.483		0.135	3690		67.3	13.3		0.135	7.79		1.35
SPLIT of J1N0H5	J1N0H7	12/19/2011	7160		1.4	5.9		0.58	58.2		0.067	1.1	B	0.87	0.40		0.036	3060		12.5	12.2		0.051	8.8	X	0.089
Analysis:																										
TDL			5			10			2			2			0.5			100			1			2		
Split Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		7.5%						10.9%									18.7%			8.6%					
	Difference > 2 TDL?		Yes - assess further			No - acceptable			Yes - assess further			No - acceptable			No - acceptable			Yes - assess further			No - acceptable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL
FS-1	J1N0H5	12/19/2011	38.3		0.673	18900		13.5	76.7		0.337	8.49		1.68	4080		50.5	378		3.37	0.0202	B	0.0303	0.689	B	1.35
SPLIT of J1N0H5	J1N0H7	12/19/2011	34.8		0.19	18300		3.4	111	X	0.24	7.9		0.27	3610		3.3	397	X	0.089	0.022		0.0049	0.76	B	0.23
Analysis:																										
TDL			1			5			5			2.5			75			5			0.2			2		
Split Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			No-Stop (acceptable)		
	Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)								
	RPD		9.6%			3.2%			36.5%						12.2%			4.9%								
	Difference > 2 TDL?		Yes - assess further			Yes - assess further			Yes - assess further			No - acceptable			Yes - assess further			Yes - assess further			No - acceptable			No - acceptable		

Sampling Area	HEIS Number	Sample Date	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Uranium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Zirconium mg/kg	Q	PQL
FS-1	J1N0H5	12/19/2011	17.6		2.69	1120		269	396		1.35	244		33.7	8.82	B	13.5	61.5		1.68	210		6.73	15.0		1.68
SPLIT of J1N0H5	J1N0H7	12/19/2011	18.2	X	0.11	995		36.3	284	X	5.0	206		52.3	23.0	MN	0.0014	51.4		0.083	221	X	0.35	13.3		0.31
Analysis:																										
TDL			4			400			2			50			1			2.5			1			2.5		
Split Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)			Yes (calc RPD)		
	RPD								32.9%									17.9%			5.1%			12.0%		
	Difference > 2 TDL?		No - acceptable			No - acceptable			Yes - assess further			No - acceptable			Yes - assess further			Yes - assess further			Yes - assess further			No - acceptable		

CALCULATION SHEET

Washington Closure Hanford

Originator N. K. Schiffem NS | Date 03/29/12 | Calc. No. 0300X-CA-V0152 | Rev. No. 0
Project 300 Area Field Remediation | Job No. 14655 | Checked J. D. Skoglie JS | Date 03/29/12
Subject UPR-300-38, 313 ESSP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations | Sheet No. 16 of 17

1 Split Analysis - UPR-300-38, 313 ESSP, and 300-270 Focused Samples

	Sampling Area	HEIS Number	Sample Date	Chloride mg/kg	Q	POL	Nitrogen in Nitrite and Nitrate mg/kg	Q	POL	Sulfate mg/kg	Q	POL	Aroclor-1254 ug/kg	Q	POL	Aroclor-1260 ug/kg	Q	POL
4	FS-1	J1N0H5	12/19/2011	5.5		4.5	10.5	D	0.90	23.0		4.5	735	D	66.9	209	D	66.9
5	SPLIT of J1N0H5	J1N0H7	12/19/2011	9.9		2.0	6.5	N	0.30	34.3		1.7	560	D	13	330	D	13
6	Analysis:																	
7		TDL		2			2.5			5			16.5			16.5		
8		Both > POL?		Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
9	Duplicate Analysis	Both >5xTDL?		No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)		
10		RPD											27.0%			*44.9%*		
11		Difference > 2 TDL?		Yes - assess further			No - acceotable			Yes - assess further			Yes - assess further			Yes - assess further		

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CALCULATION SHEET

Washington Closure Hanford

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Calc. No. 0300X-CA-V0152
Checked J. D. Skoglie

Rev. No. 0
Date 02/27/12
Sheet No. 17 of 17

Split Analysis - UPR-300-38, 313 ESSP, and 300-270 Focused Samples

Sampling Area	HEIS Number	Sample Date	Radium-226 pCi/g	Q	MDA	Uranium-233/234 AEA pCi/g	Q	MDA	Uranium-238 AEA pCi/g	Q	MDA
FS-14 resample [a]	J1N3H0	1/26/2012	0.272		0.124	0.950		0.130	0.798		0.130
Split of J1N3H0 [a]	J1N3H3	1/26/2012	0.355		0.0643	0.756		0.0480	0.663		0.0550
Analysis:											
TDL			0.1			1			1		
Split 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		

[a] Due to RAG exceedances and further excavation, resamples were taken.

Attachment 1. UPR-300-38, 313 ESSL, and 300-270 Sites Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Americium-241			Antimony-125			Bismuth-214			Cerium-144			Cesium-134			Cesium-137		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
VSP-1	J1N0C9	12/16/2011	0.040	U	0.040	0.054	U	0.054	0.426		0.041	0.125	U	0.125	0.030	U	0.030	0.024	U	0.024
VSP-2	J1N0F3	12/16/2011	0.053	U	0.053	0.089	U	0.089	0.670		0.073	0.201	U	0.201	0.055	U	0.055	0.036	U	0.036
VSP-3	J1N0D2	12/16/2011	0.095	U	0.095	0.063	U	0.063	0.456		0.064	0.140	U	0.140	0.040	U	0.040	0.030	U	0.030
VSP-4	J1N0H2	12/19/2011	0.048	U	0.048	0.082	U	0.082	0.653		0.070	0.179	U	0.179	0.044	U	0.044	0.029	U	0.029
VSP-5	J1N0F9	12/16/2011	0.084	U	0.084	0.057	U	0.057	0.415		0.052	0.125	U	0.125	0.038	U	0.038	0.027	U	0.027
VSP-6	J1N0H0	12/19/2011	0.052	U	0.052	0.069	U	0.069	0.496		0.061	0.174	U	0.174	0.057	U	0.057	0.030	U	0.030
VSP-7	J1N0F5	12/16/2011	0.055	U	0.055	0.075	U	0.075	0.518		0.069	0.182	U	0.182	0.054	U	0.054	0.035	U	0.035
VSP-8	J1N0F4	12/16/2011	0.093	U	0.093	0.062	U	0.062	0.462		0.063	0.140	U	0.140	0.074	U	0.074	0.032	U	0.032
VSP-9	J1N0F6	12/16/2011	0.036	U	0.036	0.020	U	0.020	0.424		0.019	0.046	U	0.046	0.014	U	0.014	0.009	U	0.009
VSP-10	J1N0F7	12/16/2011	0.079	U	0.079	0.163	U	0.163	0.387		0.133	0.358	U	0.358	0.089	U	0.089	0.062	U	0.062
VSP-11	J1N0H4	12/19/2011	0.168	U	0.168	0.058	U	0.058	0.609		0.056	0.144	U	0.144	0.037	U	0.037	0.023	U	0.023
VSP-12	J1N0F2	12/16/2011	0.170	U	0.170	0.156	U	0.156	0.467		0.132	0.346	U	0.346	0.100	U	0.100	0.068	U	0.068
FS-5	J1N0D8	12/16/2011	0.419	U	0.419	0.103	U	0.103	0.517		0.103	0.259	U	0.259	0.065	U	0.065	0.048	U	0.048
Duplicate of J1N0D8	J1N0F0	12/16/2011	0.061	U	0.061	0.077	U	0.077	0.483		0.059	0.192	U	0.192	0.041	U	0.041	0.028	U	0.028
FS-1	J1N0H5	12/19/2011	0.047	U	0.047	0.069	U	0.069	0.451		0.058	0.156	U	0.156	0.038	U	0.038	0.233		0.034
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.00636	U	0.187	-0.0133	U	0.0602				0.0465	U	0.134	0.0125	U	0.0317	0.312		0.0276
FS-2	J1N0D5	12/16/2011	0.501	U	0.501	0.116	U	0.116	0.567		0.100	0.278	U	0.278	0.095	U	0.095	0.054	U	0.054
FS-3	J1N0D4	12/16/2011	0.112	U	0.112	0.095	U	0.095	0.656		0.082	0.309	U	0.309	0.054	U	0.054	0.036	U	0.036
FS-4	J1N0H1	12/19/2011	0.034	U	0.034	0.034	U	0.034	0.593		0.029	0.098	U	0.098	0.024	U	0.024	0.013	U	0.013
FS-6	J1N0F8	12/16/2011	0.124	U	0.124	0.241	U	0.241	0.405		0.206	0.519	U	0.519	0.121	U	0.121	0.102	U	0.102
FS-7	J1N0F1	12/16/2011	0.422	U	0.422	0.232	U	0.232	0.850		0.171	0.413	U	0.413	0.124	U	0.124	0.104	U	0.104
FS-8	J1N0D7	12/16/2011	0.068	U	0.068	0.095	U	0.095	0.535		0.094	0.226	U	0.226	0.054	U	0.054	0.039	U	0.039
FS-9	J1N0D6	12/16/2011	0.191	U	0.191	0.061	U	0.061	0.473		0.051	0.159	U	0.159	0.040	U	0.040	0.027	U	0.027
FS-10	J1N0D3	12/16/2011	0.347	U	0.347	0.110	U	0.110	0.549		0.099	0.238	U	0.238	0.061	U	0.061	0.048	U	0.048
FS-11	J1N0D9	12/16/2011	0.372	U	0.372	0.063	U	0.063	0.414		0.056	0.239	U	0.239	0.039	U	0.039	0.028	U	0.028
FS-12	J1N0D0	12/16/2011	0.057	U	0.057	0.070	U	0.070	0.366		0.061	0.169	U	0.169	0.056	U	0.056	0.030	U	0.030
FS-13	J1N0D1	12/16/2011	0.068	U	0.068	0.093	U	0.093	0.695		0.073	0.227	U	0.227	0.055	U	0.055	0.037	U	0.037
FS-14	J1N0H3	12/19/2011	0.369	U	0.369	0.076	U	0.076	0.426		0.067	0.403	U	0.403	0.056	U	0.056	0.031	U	0.031
FS-14 resample [a]	J1N3H0	1/26/2012	0.189	U	0.189	0.141	U	0.141	0.280		0.128	0.387	U	0.387	0.067	U	0.067	0.066	U	0.066
Duplicate of J1N3H0 [a]	J1N3H1	1/26/2012	0.376	U	0.376	0.213	U	0.213	0.320		0.121	0.378	U	0.378	0.098	U	0.098	0.070	U	0.070
Equipment blank [a]	J1N3H2	1/26/2012	0.031	U	0.031	0.060	U	0.060	0.244		0.051	0.134	U	0.134	0.032	U	0.032	0.025	U	0.025
Split of J1N3H0 [a]	J1N3H3	1/26/2012	-0.00463	U	0.104	-0.0201	U	0.0798				-0.000127	U	0.154	0.0260	U	0.0431	-0.00852	U	0.0352

[a] Due to RAG exceedances and further excavation, resamples were taken.

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

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

B = method blank contamination
D = The reported value is from a dilution.
HEIS = Hanford Environmental Information System
J = estimate (organic) = blank contamination (inorganic)
M = Sample duplicate precision not met.
MDA = minimum detectable activity
N = Recovery exceeds upper or lower control limit.
P = Target analyte >25% difference between column analysis.
PCB = polychlorinated biphenyls
PAH = polycyclic aromatic hydrocarbons
PQL = practical quantitation limit
Q = qualifier
SVOA = semi-volatile organic analysis
U = undetected
UR = analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
VOA = volatile organic analysis
X = > 40% difference between the primary and confirmation detector results.

Attachment	1	Sheet No.	1 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSL, and 300-270 Sites Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Cobalt-60			Europium-152			Europium-154			Europium-155			Lead-212			Niobium-94		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
VSP-1	J1N0C9	12/16/2011	0.022	U	0.022	0.064	U	0.064	0.072	U	0.072	0.099	U	0.099	0.802		0.049	0.019	U	0.019
VSP-2	J1N0F3	12/16/2011	0.037	U	0.037	0.105	U	0.105	0.131	U	0.131	0.095	U	0.095	1.06		0.055	0.032	U	0.032
VSP-3	J1N0D2	12/16/2011	0.034	U	0.034	0.075	U	0.075	0.118	U	0.118	0.087	U	0.087	0.618		0.037	0.028	U	0.028
VSP-4	J1N0H2	12/19/2011	0.035	U	0.035	0.091	U	0.091	0.121	U	0.121	0.084	U	0.084	1.11		0.048	0.030	U	0.030
VSP-5	J1N0F9	12/16/2011	0.031	U	0.031	0.063	U	0.063	0.106	U	0.106	0.080	U	0.080	0.514		0.030	0.026	U	0.026
VSP-6	J1N0H0	12/19/2011	0.031	U	0.031	0.084	U	0.084	0.098	U	0.098	0.085	U	0.085	0.785		0.061	0.025	U	0.025
VSP-7	J1N0F5	12/16/2011	0.034	U	0.034	0.085	U	0.085	0.096	U	0.096	0.087	U	0.087	0.803		0.041	0.025	U	0.025
VSP-8	J1N0F4	12/16/2011	0.032	U	0.032	0.078	U	0.078	0.113	U	0.113	0.092	U	0.092	0.680		0.036	0.029	U	0.029
VSP-9	J1N0F6	12/16/2011	0.011	U	0.011	0.023	U	0.023	0.038	U	0.038	0.049	U	0.049	0.564		0.012	0.009	U	0.009
VSP-10	J1N0F7	12/16/2011	0.072	U	0.072	0.203	U	0.203	0.246	U	0.246	0.152	U	0.152	0.578		0.155	0.056	U	0.056
VSP-11	J1N0H4	12/19/2011	0.025	U	0.025	0.073	U	0.073	0.091	U	0.091	0.087	U	0.087	0.793		0.038	0.022	U	0.022
VSP-12	J1N0F2	12/16/2011	0.064	U	0.064	0.186	U	0.186	0.181	U	0.181	0.258	U	0.258	0.545		0.094	0.048	U	0.048
FS-5	J1N0D8	12/16/2011	0.051	U	0.051	0.122	U	0.122	0.189	U	0.189	0.173	U	0.173	0.826		0.062	0.043	U	0.043
Duplicate of J1N0D8	J1N0F0	12/16/2011	0.033	U	0.033	0.088	U	0.088	0.113	U	0.113	0.095	U	0.095	0.716		0.046	0.027	U	0.027
FS-1	J1N0H5	12/19/2011	0.028	U	0.028	0.076	U	0.076	0.087	U	0.087	0.079	U	0.079	0.710		0.041	0.023	U	0.023
SPLIT of J1N0H5	J1N0H7	12/19/2011	-0.00375	U	0.0268	-0.0155	U	0.0639	0.0403	U	0.0961	0.0317	U	0.0767						
FS-2	J1N0D5	12/16/2011	0.052	U	0.052	0.138	U	0.138	0.201	U	0.201	0.200	U	0.200	0.520		0.078	0.046	U	0.046
FS-3	J1N0D4	12/16/2011	0.038	U	0.038	0.112	U	0.112	0.129	U	0.129	0.161	U	0.161	1.02		0.062	0.032	U	0.032
FS-4	J1N0H1	12/19/2011	0.013	U	0.013	0.040	U	0.040	0.044	U	0.044	0.148	U	0.148	0.996		0.021	0.011	U	0.011
FS-6	J1N0F8	12/16/2011	0.100	U	0.100	0.264	U	0.264	0.290	U	0.290	0.243	U	0.243	0.799		0.207	0.092	U	0.092
FS-7	J1N0F1	12/16/2011	0.117	U	0.117	0.259	U	0.259	0.378	U	0.378	0.258	U	0.258	0.645		0.108	0.093	U	0.093
FS-8	J1N0D7	12/16/2011	0.056	U	0.056	0.112	U	0.112	0.137	U	0.137	0.109	U	0.109	1.05		0.059	0.034	U	0.034
FS-9	J1N0D6	12/16/2011	0.026	U	0.026	0.072	U	0.072	0.087	U	0.087	0.095	U	0.095	0.700		0.039	0.022	U	0.022
FS-10	J1N0D3	12/16/2011	0.052	U	0.052	0.120	U	0.120	0.170	U	0.170	0.144	U	0.144	0.885		0.078	0.042	U	0.042
FS-11	J1N0D9	12/16/2011	0.023	U	0.023	0.079	U	0.079	0.081	U	0.081	0.158	U	0.158	0.592		0.043	0.021	U	0.021
FS-12	J1N0D0	12/16/2011	0.028	U	0.028	0.085	U	0.085	0.088	U	0.088	0.086	U	0.086	0.564		0.039	0.026	U	0.026
FS-13	J1N0D1	12/16/2011	0.041	U	0.041	0.113	U	0.113	0.138	U	0.138	0.112	U	0.112	1.08		0.060	0.032	U	0.032
FS-14	J1N0H3	12/19/2011	0.020	U	0.020	0.094	U	0.094	0.059	U	0.059	0.234	U	0.234	0.588		0.049	0.022	U	0.022
FS-14 resample [a]	J1N3H0	1/26/2012	0.066	U	0.066	0.165	U	0.165	0.183	U	0.183	0.166	U	0.166	0.414		0.084	0.045	U	0.045
Duplicate of J1N3H0 [a]	J1N3H1	1/26/2012	0.109	U	0.109	0.232	U	0.232	0.312	U	0.312	0.216	U	0.216	0.495		0.172	0.072	U	0.072
Equipment blank [a]	J1N3H2	1/26/2012	0.030	U	0.030	0.076	U	0.076	0.084	U	0.084	0.062	U	0.062	0.340		0.037	0.022	U	0.022
Split of J1N3H0 [a]	J1N3H3	1/26/2012	0.0199	U	0.0421	0.0244	U	0.0900	-0.0120	U	0.126	0.0219	U	0.0829						

Attachment	1	Sheet No.	2 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSL, and 300-270 Sites Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Potassium-40			Radium-226			Radium-228			Ruthenium-106			Thorium-228			Thorium-232		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
VSP-1	J1N0C9	12/16/2011	15.4		0.222	0.414		0.040	0.618		0.095	0.184	U	0.184	0.782		0.048	0.618		0.095
VSP-2	J1N0F3	12/16/2011	15.6		0.447	0.650		0.070	0.996		0.144	0.304	U	0.304	1.04		0.054	0.996		0.144
VSP-3	J1N0D2	12/16/2011	12.2		0.236	0.442		0.062	0.713		0.121	0.261	U	0.261	0.605		0.036	0.713		0.121
VSP-4	J1N0H2	12/19/2011	19.0		0.424	0.634		0.068	0.820		0.154	0.252	U	0.252	1.08		0.047	0.820		0.154
VSP-5	J1N0F9	12/16/2011	11.4		0.304	0.403		0.050	0.696		0.124	0.223	U	0.223	0.503		0.029	0.696		0.124
VSP-6	J1N0H0	12/19/2011	13.2		0.329	0.481		0.059	0.640		0.144	0.238	U	0.238	0.767		0.060	0.640		0.144
VSP-7	J1N0F5	12/16/2011	14.9		0.292	0.503		0.067	0.840		0.144	0.262	U	0.262	0.787		0.040	0.840		0.144
VSP-8	J1N0F4	12/16/2011	12.4		0.352	0.448		0.061	0.863		0.133	0.270	U	0.270	0.667		0.036	0.863		0.133
VSP-9	J1N0F6	12/16/2011	14.0		0.114	0.412		0.018	0.607		0.041	0.077	U	0.077	0.554		0.012	0.607		0.041
VSP-10	J1N0F7	12/16/2011	11.0		0.975	0.376		0.129	0.532		0.287	0.534	U	0.534	0.568		0.152	0.532		0.287
VSP-11	J1N0H4	12/19/2011	15.1		0.267	0.592		0.055	0.834		0.105	0.187	U	0.187	0.777		0.038	0.834		0.105
VSP-12	J1N0F2	12/16/2011	11.2		0.544	0.454		0.128	0.693		0.264	0.535	U	0.535	0.534		0.092	0.693		0.264
FS-5	J1N0D8	12/16/2011	16.6		0.446	0.502		0.100	0.843		0.219	0.405	U	0.405	0.809		0.060	0.843		0.219
Duplicate of J1N0D8	J1N0F0	12/16/2011	13.9		0.392	0.469		0.057	0.567		0.130	0.240	U	0.240	0.701		0.046	0.567		0.130
FS-1	J1N0H5	12/19/2011	11.9		0.351	0.438		0.056	0.729		0.112	0.212	U	0.212	0.696		0.040	0.729		0.112
SPLIT of J1N0H5	J1N0H7	12/19/2011				0.440		0.0461	0.729		0.0956	-0.00592	U	0.221						
FS-2	J1N0D5	12/16/2011	15.2		0.562	0.550		0.097	0.773		0.180	0.413	U	0.413	0.509		0.077	0.773		0.180
FS-3	J1N0D4	12/16/2011	19.3		0.437	0.637		0.080	1.01		0.150	0.317	U	0.317	1.00		0.061	1.01		0.150
FS-4	J1N0H1	12/19/2011	15.8		0.158	0.576		0.028	0.822		0.054	0.108	U	0.108	0.975		0.021	0.822		0.054
FS-6	J1N0F8	12/16/2011	10.9		1.07	0.393		0.200	0.463		0.417	0.895	U	0.895	0.784		0.203	0.463		0.417
FS-7	J1N0F1	12/16/2011	13.0		1.13	0.825		0.166	1.02		0.424	0.870	U	0.870	0.632		0.106	1.02		0.424
FS-8	J1N0D7	12/16/2011	14.8		0.453	0.520		0.092	0.910		0.176	0.299	U	0.299	1.03		0.057	0.910		0.176
FS-9	J1N0D6	12/16/2011	12.7		0.267	0.459		0.050	0.679		0.129	0.222	U	0.222	0.686		0.038	0.679		0.129
FS-10	J1N0D3	12/16/2011	14.0		0.444	0.534		0.096	0.727		0.215	0.394	U	0.394	0.866		0.076	0.727		0.215
FS-11	J1N0D9	12/16/2011	11.9		0.267	0.402		0.054	0.525		0.119	0.240	U	0.240	0.580		0.042	0.525		0.119
FS-12	J1N0D0	12/16/2011	11.0		0.308	0.356		0.059	0.528		0.130	0.240	U	0.240	0.550		0.038	0.528		0.130
FS-13	J1N0D1	12/16/2011	16.2		0.436	0.675		0.070	0.895		0.174	0.336	U	0.336	1.06		0.059	0.895		0.174
FS-14	J1N0H3	12/19/2011	11.3		0.166	0.414		0.069	0.596		0.112	0.260	U	0.260	0.576		0.048	0.596		0.112
FS-14 resample [a]	J1N3H0	1/26/2012	10.3		0.380	0.272		0.124	0.454		0.226	0.521	U	0.521	0.401		0.081	0.454		0.226
Duplicate of J1N3H0 [a]	J1N3H1	1/26/2012	7.54		0.718	0.311		0.118	0.681		0.353	0.644	U	0.644	0.479		0.167	0.681		0.353
Equipment blank [a]	J1N3H2	1/26/2012	6.97		0.316	0.237		0.050	0.322		0.107	0.192	U	0.192	0.330		0.036	0.322		0.107
Split of J1N3H0 [a]	J1N3H3	1/26/2012				0.355		0.0643	0.783	U	0.263	0.0289	U	0.293						

Attachment	1	Sheet No.	3 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSL, and 300-270 Sites Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Uranium-235			Uranium-238			Zinc-65		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
VSP-1	J1N0C9	12/16/2011	0.195	UJ	0.195	2.77	U	2.77	0.051	U	0.051
VSP-2	J1N0F3	12/16/2011	0.229	U	0.229	7.57		4.15	0.101	U	0.101
VSP-3	J1N0D2	12/16/2011	0.174	U	0.174	4.23	U	4.23	0.094	U	0.094
VSP-4	J1N0H2	12/19/2011	0.232	U	0.232	4.18	U	4.18	0.082	U	0.082
VSP-5	J1N0F9	12/16/2011	0.148	U	0.148	3.39	U	3.39	0.077	U	0.077
VSP-6	J1N0H0	12/19/2011	0.178	U	0.178	3.56	U	3.56	0.071	U	0.071
VSP-7	J1N0F5	12/16/2011	0.186	U	0.186	3.90	U	3.90	0.064	U	0.064
VSP-8	J1N0F4	12/16/2011	0.171	U	0.171	4.26	U	4.26	0.083	U	0.083
VSP-9	J1N0F6	12/16/2011	0.090	U	0.090	1.60	U	1.60	0.031	U	0.031
VSP-10	J1N0F7	12/16/2011	0.448	U	0.448	8.27	U	8.27	0.158	U	0.158
VSP-11	J1N0H4	12/19/2011	0.155	U	0.155	3.98	U	3.98	0.061	U	0.061
VSP-12	J1N0F2	12/16/2011	0.398	U	0.398	6.99	U	6.99	0.150	U	0.150
FS-5	J1N0D8	12/16/2011	0.834		0.330	19.2		6.80	0.150	U	0.150
Duplicate of J1N0D8	J1N0F0	12/16/2011	0.717		0.244	16.7		4.09	0.085	U	0.085
FS-1	J1N0H5	12/19/2011	0.402		0.215	4.98		3.66	0.073	U	0.073
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.275		0.126	3.76		1.05	0.0116	U	0.0623
FS-2	J1N0D5	12/16/2011	1.11		0.354	24.2		6.26	0.153	U	0.153
FS-3	J1N0D4	12/16/2011	3.69		0.464	64.1		5.01	0.098	U	0.098
FS-4	J1N0H1	12/19/2011	2.16		0.137	36.5		1.91	0.032	U	0.032
FS-6	J1N0F8	12/16/2011	0.491	U	0.491	11.9	U	11.9	0.207	U	0.207
FS-7	J1N0F1	12/16/2011	0.540	U	0.540	9.52	U	9.52	0.296	U	0.296
FS-8	J1N0D7	12/16/2011	0.517		0.310	9.60		5.34	0.112	U	0.112
FS-9	J1N0D6	12/16/2011	0.214	U	0.232	5.71		3.28	0.061	U	0.061
FS-10	J1N0D3	12/16/2011	0.245	U	0.245	5.65	U	5.65	0.142	U	0.142
FS-11	J1N0D9	12/16/2011	3.68		0.341	76.2		3.25	0.051	U	0.051
FS-12	J1N0D0	12/16/2011	0.341		0.196	9.46		2.81	0.064	U	0.064
FS-13	J1N0D1	12/16/2011	0.426		0.313	10.3		5.65	0.112	U	0.112
FS-14	J1N0H3	12/19/2011	9.81		0.452	194		3.26	0.047	U	0.047
FS-14 resample [a]	J1N3H0	1/26/2012	0.372	U	0.372	7.04	U	7.04	0.111	U	0.111
Duplicate of J1N3H0 [a]	J1N3H1	1/26/2012	0.433	U	0.433	11.0	U	11.0	0.220	U	0.220
Equipment blank [a]	J1N3H2	1/26/2012	0.161	U	0.161	3.14	U	3.14	0.053	U	0.053
Split of J1N3H0 [a]	J1N3H3	1/26/2012	0.0503	U	0.171	0.227	U	0.787	-0.0997	U	0.0785

Attachment	1	Sheet No.	4 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSL, and 300-270 Sites Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Uranium-233/234 AEA			Uranium-234 AEA			Uranium-235 AEA			Uranium-238 AEA			Total beta radiostrontium GPC		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
VSP-1	J1N0C9	12/16/2011	1.42		0.187				0.089	U	0.226	1.30		0.187	0.044	U	0.310
VSP-2	J1N0F3	12/16/2011	2.11		0.185				0.176	UJ	0.224	1.98		0.185	0.085	U	0.320
VSP-3	J1N0D2	12/16/2011	0.587		0.195				0.031	UJ	0.236	1.02		0.195	0.009	U	0.269
VSP-4	J1N0H2	12/19/2011	1.20		0.204				0.032	U	0.247	1.52		0.204	0.138	U	0.308
VSP-5	J1N0F9	12/16/2011	0.820		0.224				0.071	U	0.271	0.761		0.224	-0.174	U	0.388
VSP-6	J1N0H0	12/19/2011	1.17		0.203				0.064	U	0.246	1.52		0.203	-0.075	U	0.313
VSP-7	J1N0F5	12/16/2011	2.48		0.202				0.223	UJ	0.244	3.03		0.202	0.115	U	0.305
VSP-8	J1N0F4	12/16/2011	1.62		0.217				0.172	UJ	0.263	1.59		0.217	-0.056	U	0.306
VSP-9	J1N0F6	12/16/2011	1.22		0.248				0.188	UJ	0.240	1.22		0.198	0.333	U	0.352
VSP-10	J1N0F7	12/16/2011	0.394		0.274				0.087	UJ	0.332	0.322		0.274	4.54		0.297
VSP-11	J1N0H4	12/19/2011	1.24		0.193				0.031	U	0.234	1.16		0.193	-0.036	U	0.317
VSP-12	J1N0F2	12/16/2011	0.822		0.242				0.038	UJ	0.293	0.759		0.242	0.120	U	0.321
FS-5	J1N0D8	12/16/2011	17.2		0.316				0.799	J	0.306	16.7		0.316	0.003	U	0.400
Duplicate of J1N0D8	J1N0F0	12/16/2011	24.4		0.330				1.07		0.248	23.6		0.296	0.077	U	0.341
FS-1	J1N0H5	12/19/2011	12.0		0.105				1.21		0.031	12.2		0.097	-0.117	U	0.319
SPLIT of J1N0H5	J1N0H7	12/19/2011	11.7		0.0970				0.557		0.0870	11.5		0.0870	0.0459	U	0.222
FS-2	J1N0D5	12/16/2011	20.8		0.357				1.55	J	0.216	18.5		0.336	-0.082	U	0.310
FS-3	J1N0D4	12/16/2011	42.3		0.552				4.37	J	0.231	42.3		0.523	0.144	U	0.287
FS-4	J1N0H1	12/19/2011	25.9		0.296				0.938		0.248	25.5		0.296	-0.021	U	0.305
FS-6	J1N0F8	12/16/2011	0.367		0.216				0.068	UJ	0.262	0.819		0.216	0.036	U	0.312
FS-7	J1N0F1	12/16/2011	6.99		0.216				0.377	J	0.262	8.46		0.216	-0.027	U	0.323
FS-8	J1N0D7	12/16/2011	6.34		0.277				0.385	J	0.268	6.40		0.221	0.018	U	0.318
FS-9	J1N0D6	12/16/2011	6.29		0.269				0.374	J	0.260	6.10		0.215	0.076	U	0.321
FS-10	J1N0D3	12/16/2011	1.40		0.191				0.151	UJ	0.231	1.05		0.191	0.152	U	0.276
FS-11	J1N0D9	12/16/2011	121		0.714				8.23	J	0.232	116		0.681	-0.030	U	0.362
FS-12	J1N0D0	12/16/2011	9.38		0.232				0.499	J	0.224	9.28		0.232	-0.006	U	0.271
FS-13	J1N0D1	12/16/2011	8.61		0.280				0.602	J	0.271	7.99		0.280	0.038	U	0.261
FS-14	J1N0H3	12/19/2011	309		1.04				16.1		0.250	308		0.960	-0.153	U	0.299
FS-14 resample [a]	J1N3H0	1/26/2012	0.950		0.130				0.041	U	0.157	0.798		0.130			
Duplicate of J1N3H0 [a]	J1N3H1	1/26/2012	0.478		0.135				0.043	U	0.164	0.495		0.135			
Equipment blank [a]	J1N3H2	1/26/2012	0.119	U	0.163				0.021	U	0.158	0.102	U	0.130			
Split of J1N3H0 [a]	J1N3H3	1/26/2012				0.756		0.0480	0.0574		0.0480	0.663		0.0550			

Attachment	1	Sheet No.	5 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglic	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011	6790	J	3.86	0.463	UJ	0.463	2.75		0.771	72.8		0.386	0.285		0.154	0.813	B	1.54
VSP-2	J1N0F3	12/16/2011	8450	J	4.06	0.487	UJ	0.487	4.20		0.812	51.8		0.406	0.350		0.162	0.921	B	1.62
VSP-3	J1N0D2	12/16/2011	6750	J	4.02	0.483	UJ	0.483	2.35		0.804	82.0		0.402	0.315		0.161	0.641	B	1.61
VSP-4	J1N0H2	12/19/2011	7380		4.13	0.496	U	0.496	3.37		0.827	86.1		0.413	0.254		0.165	0.782	B	1.65
VSP-5	J1N0F9	12/16/2011	9010		3.83	0.459	U	0.459	4.00		0.766	74.1		0.383	0.299		0.153	0.931	B	1.53
VSP-6	J1N0H0	12/19/2011	8100		3.96	0.475	U	0.475	3.23		0.792	62.8		0.396	0.271		0.158	0.996	B	1.58
VSP-7	J1N0F5	12/16/2011	7230	J	4.23	0.508	UJ	0.508	3.14		0.846	77.1		0.423	0.298		0.169	1.41	B	1.69
VSP-8	J1N0F4	12/16/2011	7520	J	3.25	0.390	UJ	0.390	3.08		0.651	73.3		0.325	0.324		0.130	0.835	B	1.30
VSP-9	J1N0F6	12/16/2011	6340	J	3.25	0.390	UJ	0.390	2.57		0.651	69.6		0.325	0.264		0.130	0.703	B	1.30
VSP-10	J1N0F7	12/16/2011	6300	J	3.49	0.418	UJ	0.418	2.26		0.697	64.3		0.349	0.276		0.139	0.824	B	1.39
VSP-11	J1N0H4	12/19/2011	8150		4.64	0.557	U	0.557	3.26		0.929	82.6		0.464	0.283		0.186	1.18	B	1.86
VSP-12	J1N0F2	12/16/2011	8810	J	3.94	0.473	UJ	0.473	3.58		0.788	82.3		0.394	0.415		0.158	0.794	B	1.58
FS-5	J1N0D8	12/16/2011	8220	J	4.64	0.557	UJ	0.557	2.93		0.928	87.5		0.464	0.312		0.186	1.51	B	1.86
Duplicate of J1N0D8	J1N0F0	12/16/2011	7290	J	4.02	0.483	UJ	0.483	3.21		0.805	75.5		0.402	0.298		0.161	1.17	B	1.61
FS-1	J1N0H5	12/19/2011	7720		3.37	0.404	U	0.404	6.39		0.673	64.9		0.337	0.250		0.135	1.45		1.35
SPLIT of J1N0H5	J1N0H7	12/19/2011	7160		1.4	1.0		0.34	5.9		0.58	58.2		0.067	0.029	U	0.029	1.1	B	0.87
FS-2	J1N0D5	12/16/2011	7180	J	3.88	0.466	UJ	0.466	2.48		0.776	80.1		0.388	0.260		0.155	1.38	B	1.55
FS-3	J1N0D4	12/16/2011	7340	J	3.79	0.455	UJ	0.455	2.42		0.758	75.2		0.379	0.307		0.152	0.937	B	1.52
FS-4	J1N0H1	12/19/2011	7420		3.37	0.405	U	0.405	3.46		0.675	70.5		0.337	0.265		0.135	0.682	B	1.35
FS-6	J1N0F8	12/16/2011	7350	J	4.17	0.500	UJ	0.500	2.79		0.833	80.0		0.417	0.314		0.167	0.821	B	1.67
FS-7	J1N0F1	12/16/2011	9320	J	4.39	0.526	UJ	0.526	12.5		0.877	96.2		0.439	0.300		0.175	1.58	B	1.75
FS-8	J1N0D7	12/16/2011	7250	J	4.49	0.539	UJ	0.539	2.83		0.899	84.0		0.449	0.355		0.180	0.773	B	1.80
FS-9	J1N0D6	12/16/2011	6530	J	4.32	0.518	UJ	0.518	2.36		0.864	57.3		0.432	0.327		0.173	0.541	B	1.73
FS-10	J1N0D3	12/16/2011	7380	J	4.18	0.502	UJ	0.502	2.44		0.836	89.5		0.418	0.327		0.167	1.01	B	1.67
FS-11	J1N0D9	12/16/2011	5720	J	3.74	0.448	UJ	0.448	2.01		0.747	63.2		0.374	0.305		0.149	0.585	B	1.49
FS-12	J1N0D0	12/16/2011	5630	J	4.00	0.480	UJ	0.480	1.95		0.800	96.3		0.400	0.281		0.160	0.449	B	1.60
FS-13	J1N0D1	12/16/2011	8000	J	3.60	0.432	UJ	0.432	3.64		0.720	78.2		0.360	0.347		0.144	0.911	B	1.44
FS-14	J1N0H3	12/19/2011	7120		3.44	0.413	U	0.413	2.33		0.689	88.2		0.344	0.259		0.138	0.686	B	1.38
Equipment Blank	J1N0H6	12/19/2011	164		4.27	0.512	U	0.512	0.853	U	0.853	1.60		0.427	0.171	U	0.171	1.71	U	1.71

Attachment	1	Sheet No.	6 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	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
VSP-1	J1N0C9	12/16/2011	0.0935	B	0.154	3320		77.1	8.24		0.154	5.79		1.54	10.0		0.771	18400		15.4
VSP-2	J1N0F3	12/16/2011	0.114	B	0.162	8350		81.2	11.5		0.162	7.48		1.62	16.7		0.812	21800		16.2
VSP-3	J1N0D2	12/16/2011	0.107	B	0.161	5760		80.4	8.77		0.161	6.91		1.61	15.0		0.804	21600		16.1
VSP-4	J1N0H2	12/19/2011	0.0930	B	0.165	10100		82.7	9.19		0.165	6.24		1.65	11.0		0.827	20900		16.5
VSP-5	J1N0F9	12/16/2011	0.124	B	0.153	7880		76.6	12.4		0.153	8.07		1.53	16.3		0.766	24100		15.3
VSP-6	J1N0H0	12/19/2011	0.0928	B	0.158	6320		79.2	14.7		0.158	7.00		1.58	18.0		0.792	21500		15.8
VSP-7	J1N0F5	12/16/2011	0.192		0.169	8820		84.6	10.7		0.169	6.14		1.69	15.2		0.846	19100		16.9
VSP-8	J1N0F4	12/16/2011	0.107	B	0.130	6640		65.1	9.43		0.130	6.48		1.30	60.7		0.651	19500		13.0
VSP-9	J1N0F6	12/16/2011	0.0873	B	0.130	5740		65.1	9.19		0.130	5.27		1.30	10.8		0.651	16900		13.0
VSP-10	J1N0F7	12/16/2011	0.0923	B	0.139	4840		69.7	7.45		0.139	5.63		1.39	10.7		0.697	17700		13.9
VSP-11	J1N0H4	12/19/2011	0.111	B	0.186	7140		92.9	12.2		0.186	6.89		1.86	13.5		0.929	22500		18.6
VSP-12	J1N0F2	12/16/2011	0.115	B	0.158	6990		78.8	7.71		0.158	8.08		1.58	18.7		0.788	24700		15.8
FS-5	J1N0D8	12/16/2011	0.196		0.186	4670		92.8	12.7		0.186	6.32		1.86	91.3		0.928	19300		18.6
Duplicate of J1N0D8	J1N0F0	12/16/2011	0.168		0.161	5280		80.5	7.81		0.161	6.20		1.61	13.3		0.805	18300		16.1
FS-1	J1N0H5	12/19/2011	0.483		0.135	3690		67.3	13.3		0.135	7.79		1.35	38.3		0.673	18900		13.5
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.40		0.036	3060		12.5	12.2		0.051	8.8	X	0.089	34.8		0.19	18300		3.4
FS-2	J1N0D5	12/16/2011	0.173		0.155	5360		77.6	8.41		0.155	6.03		1.55	15.3		0.776	17700		15.5
FS-3	J1N0D4	12/16/2011	0.123	B	0.152	3540		75.8	9.65		0.152	5.53		1.52	10.8		0.758	18600		15.2
FS-4	J1N0H1	12/19/2011	0.0971	B	0.135	12000		67.5	11.5		0.135	7.67		1.35	17.4		0.675	23300		13.5
FS-6	J1N0F8	12/16/2011	0.103	B	0.167	6780		83.3	9.03		0.167	6.13		1.67	12.4		0.833	20100		16.7
FS-7	J1N0F1	12/16/2011	0.136	B	0.175	34400		87.7	14.7		0.175	5.50		1.75	20.1		0.877	16900		17.5
FS-8	J1N0D7	12/16/2011	0.117	B	0.180	7500		89.9	9.01		0.180	7.82		1.80	16.9		0.899	24000		18.0
FS-9	J1N0D6	12/16/2011	0.0974	B	0.173	5560		86.4	7.50		0.173	7.91		1.73	14.0		0.864	24500		17.3
FS-10	J1N0D3	12/16/2011	0.109	B	0.167	5310		83.6	9.61		0.167	7.22		1.67	12.5		0.836	22300		16.7
FS-11	J1N0D9	12/16/2011	0.0962	B	0.149	5760		74.7	6.69		0.149	7.21		1.49	13.6		0.747	21900		14.9
FS-12	J1N0D0	12/16/2011	0.0995	B	0.160	5370		80.0	5.47		0.160	7.41		1.60	13.6		0.800	23500		16.0
FS-13	J1N0D1	12/16/2011	0.109	B	0.144	16600		72.0	11.0		0.144	6.67		1.44	17.2		0.720	19600		14.4
FS-14	J1N0H3	12/19/2011	0.107	B	0.138	6630		68.9	10.7		0.138	7.88		1.38	21.7		0.689	26900		13.8
Equipment Blank	J1N0H6	12/19/2011	0.171	U	0.171	31.9	B	85.3	0.171	U	0.171	1.71	U	1.71	0.853	U	0.853	229		17.1

Attachment	1	Sheet No.	7 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Lead			Lithium			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011	3.94		0.386	6.81		1.93	3650		57.8	307		3.86	0.0235	U	0.0235	0.268	B	1.54
VSP-2	J1N0F3	12/16/2011	4.04		0.406	8.83		2.03	5720		60.9	351		4.06	0.0249	U	0.0249	0.335	B	1.62
VSP-3	J1N0D2	12/16/2011	3.46		0.402	6.35		2.01	4690		60.3	315		4.02	0.0290	U	0.0290	0.333	B	1.61
VSP-4	J1N0H2	12/19/2011	3.68		0.413	8.54		2.07	4810		62.0	334		4.13	0.0256	U	0.0256	0.307	B	1.65
VSP-5	J1N0F9	12/16/2011	4.21		0.383	9.91		1.91	6760		57.4	399		3.83	0.0272	U	0.0272	0.459	B	1.53
VSP-6	J1N0H0	12/19/2011	3.68		0.396	8.70		1.98	5410		59.4	323		3.96	0.0276	U	0.0276	0.363	B	1.58
VSP-7	J1N0F5	12/16/2011	4.81		0.423	8.07		2.12	4290		63.5	289		4.23	0.0286	U	0.0286	0.320	B	1.69
VSP-8	J1N0F4	12/16/2011	8.07		0.325	7.55		1.63	4340		48.8	307		3.25	0.0237	U	0.0237	0.379	B	1.30
VSP-9	J1N0F6	12/16/2011	3.25		0.325	6.83		1.63	4010		48.8	281		3.25	0.0247	U	0.0247	0.428	B	1.30
VSP-10	J1N0F7	12/16/2011	3.19		0.349	6.27		1.74	3580		52.3	265		3.49	0.0281	U	0.0281	0.267	B	1.39
VSP-11	J1N0H4	12/19/2011	4.17		0.464	8.18		2.32	5030		69.6	355		4.64	0.0248	U	0.0248	0.420	B	1.86
VSP-12	J1N0F2	12/16/2011	4.67		0.394	8.59		1.97	4890		59.1	351		3.94	0.0210	B	0.0264	0.415	B	1.58
FS-5	J1N0D8	12/16/2011	6.80		0.464	7.34		2.32	4340		69.6	320		4.64	0.100		0.0255	0.560	B	1.86
Duplicate of J1N0D8	J1N0F0	12/16/2011	8.36		0.402	5.95		2.01	3360		60.4	256		4.02	0.135		0.0273	0.393	B	1.61
FS-1	J1N0H5	12/19/2011	76.7		0.337	8.49		1.68	4080		50.5	378		3.37	0.0202	B	0.0303	0.689	B	1.35
SPLIT of J1N0H5	J1N0H7	12/19/2011	111	X	0.24	7.9		0.27	3610		3.3	397	X	0.089	0.022		0.0049	0.76	B	0.23
FS-2	J1N0D5	12/16/2011	8.16		0.388	7.06		1.94	3670		58.2	310		3.88	0.0737		0.0271	0.996	B	1.55
FS-3	J1N0D4	12/16/2011	4.49		0.379	7.14		1.90	3900		56.9	289		3.79	0.140		0.0254	0.269	B	1.52
FS-4	J1N0H1	12/19/2011	4.78		0.337	8.25		1.69	5380		50.6	339		3.37	0.0302	U	0.0302	0.364	B	1.35
FS-6	J1N0F8	12/16/2011	4.02		0.417	7.57		2.08	4510		62.5	299		4.17	0.0274	U	0.0274	0.345	B	1.67
FS-7	J1N0F1	12/16/2011	4.39		0.439	12.4		2.19	7960		65.8	288		4.39	0.0306	U	0.0306	0.926	B	1.75
FS-8	J1N0D7	12/16/2011	6.46		0.449	6.40		2.25	4550		67.4	330		4.49	0.0243	U	0.0243	0.360	B	1.80
FS-9	J1N0D6	12/16/2011	3.83		0.432	5.66		2.16	4740		64.8	330		4.32	0.0283	U	0.0283	0.353	B	1.73
FS-10	J1N0D3	12/16/2011	4.38		0.418	6.41		2.09	4360		62.7	352		4.18	0.0262	U	0.0262	0.498	B	1.67
FS-11	J1N0D9	12/16/2011	4.05		0.374	4.62		1.87	4250		56.1	303		3.74	0.0277	U	0.0277	0.355	B	1.49
FS-12	J1N0D0	12/16/2011	2.45		0.400	4.13		2.00	4190		60.0	306		4.00	0.0243	U	0.0243	0.427	B	1.60
FS-13	J1N0D1	12/16/2011	4.31		0.360	8.77		1.80	4860		54.0	294		3.60	0.0263	U	0.0263	0.558	B	1.44
FS-14	J1N0H3	12/19/2011	10.5		0.344	6.46		1.72	5390		51.7	372		3.44	0.0287	U	0.0287	0.500	B	1.38
Equipment Blank	J1N0H6	12/19/2011	0.377	B	0.427	2.13	U	2.13	19.7	B	64.0	5.07		4.27	0.0245	U	0.0245	1.71	U	1.71

Attachment	1	Sheet No.	8 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011	8.14		3.08	1410		308	0.231	U	0.231	1320		1.54	0.154	U	0.154	221		38.6
VSP-2	J1N0F3	12/16/2011	12.7		3.25	1290		325	0.244	U	0.244	1240		1.62	0.162	U	0.162	441		40.6
VSP-3	J1N0D2	12/16/2011	11.2		3.22	948		322	0.241	U	0.241	1310		1.61	0.161	U	0.161	301		40.2
VSP-4	J1N0H2	12/19/2011	9.45		3.31	1530		331	0.248	U	0.248	448		1.65	0.165	U	0.165	263		41.3
VSP-5	J1N0F9	12/16/2011	16.8		3.06	1150		306	0.230	U	0.230	928		1.53	0.153	U	0.153	336		38.3
VSP-6	J1N0H0	12/19/2011	23.4		3.17	1080		317	0.238	U	0.238	369		1.58	0.158	U	0.158	287		39.6
VSP-7	J1N0F5	12/16/2011	9.15		3.38	1160		338	0.254	U	0.254	926		1.69	0.169	U	0.169	310		42.3
VSP-8	J1N0F4	12/16/2011	9.43		2.60	1220		260	0.195	U	0.195	752		1.30	0.130	U	0.130	278		32.5
VSP-9	J1N0F6	12/16/2011	13.0		2.60	1040		260	0.195	U	0.195	1010		1.30	0.130	U	0.130	234		32.5
VSP-10	J1N0F7	12/16/2011	7.43		2.79	1150		279	0.209	U	0.209	843		1.39	0.139	U	0.139	234		34.9
VSP-11	J1N0H4	12/19/2011	11.1		3.71	1470		371	0.279	U	0.279	646		1.86	0.186	U	0.186	240		46.4
VSP-12	J1N0F2	12/16/2011	9.49		3.15	1050		315	0.236	U	0.236	1260		1.58	0.158	U	0.158	426		39.4
FS-5	J1N0D8	12/16/2011	11.4		3.71	1430		371	0.279	U	0.279	1280		1.86	0.186	U	0.186	501		46.4
Duplicate of J1N0D8	J1N0F0	12/16/2011	7.68		3.22	1310		322	0.241	U	0.241	1210		1.61	0.161	U	0.161	426		40.2
FS-1	J1N0H5	12/19/2011	17.6		2.69	1120		269	0.202	U	0.202	396		1.35	0.135	U	0.135	244		33.7
SPLIT of J1N0H5	J1N0H7	12/19/2011	18.2	X	0.11	995		36.3	0.76	U	0.76	284	X	5.0	0.14	U	0.14	206		52.3
FS-2	J1N0D5	12/16/2011	9.60		3.11	1140		311	0.233	U	0.233	1080		1.55	0.155	U	0.155	388		38.8
FS-3	J1N0D4	12/16/2011	9.24		3.03	1400		303	0.227	U	0.227	1090		1.52	0.152	U	0.152	209		37.9
FS-4	J1N0H1	12/19/2011	10.7		2.70	1110		270	0.202	U	0.202	370		1.35	0.135	U	0.135	349		33.7
FS-6	J1N0F8	12/16/2011	9.38		3.33	1270		333	0.250	U	0.250	1390		1.67	0.167	U	0.167	347		41.7
FS-7	J1N0F1	12/16/2011	12.2		3.51	1210		351	0.263	U	0.263	1550		1.75	0.175	U	0.175	922		43.9
FS-8	J1N0D7	12/16/2011	9.34		3.59	1030		359	0.27	U	0.27	1360		1.80	0.180	U	0.180	589		44.9
FS-9	J1N0D6	12/16/2011	9.47		3.46	866		346	0.259	U	0.259	1010		1.73	0.173	U	0.173	412		43.2
FS-10	J1N0D3	12/16/2011	9.07		3.34	1140		334	0.251	U	0.251	1210		1.67	0.167	U	0.167	333		41.8
FS-11	J1N0D9	12/16/2011	9.68		2.99	716		299	0.224	U	0.224	1140		1.49	0.149	U	0.149	491		37.4
FS-12	J1N0D0	12/16/2011	7.37		3.20	558		320	0.240	U	0.240	1340		1.60	0.160	U	0.160	422		40.0
FS-13	J1N0D1	12/16/2011	10.3		2.88	1060		288	0.216	U	0.216	1390		1.44	0.144	U	0.144	464		36.0
FS-14	J1N0H3	12/19/2011	11.3		2.76	1130		276	0.207	U	0.207	529		1.38	0.138	U	0.138	520		34.4
Equipment Blank	J1N0H6	12/19/2011	3.41	U	3.41	49.1	B	341	0.256	U	0.256	118		1.71	0.171	U	0.171	17.5	B	42.7

Attachment	1	Sheet No.	9 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Uranium			Vanadium			Zinc			Zirconium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011	15.4	U	15.4	47.5		1.93	37.1		7.71	16.9		1.93
VSP-2	J1N0F3	12/16/2011	16.2	U	16.2	69.2		2.03	47.6		8.12	22.3		2.03
VSP-3	J1N0D2	12/16/2011	16.1	U	16.1	63.5		2.01	42.5		8.04	21.9		2.01
VSP-4	J1N0H2	12/19/2011	16.5	U	16.5	59.5		2.07	41.4		8.27	16.2		2.07
VSP-5	J1N0F9	12/16/2011	15.3	U	15.3	71.6		1.91	49.3		7.66	22.8		1.91
VSP-6	J1N0H0	12/19/2011	15.8	U	15.8	62.8		1.98	42.5		7.92	20.5		1.98
VSP-7	J1N0F5	12/16/2011	16.9	U	16.9	54.3		2.12	81.6		8.46	19.5		2.12
VSP-8	J1N0F4	12/16/2011	13.0	U	13.0	55.8		1.63	44.0		6.51	20.0		1.63
VSP-9	J1N0F6	12/16/2011	13.0	U	13.0	47.0		1.63	37.1		6.51	15.9		1.63
VSP-10	J1N0F7	12/16/2011	13.9	U	13.9	52.3		1.74	38.4		6.97	19.2		1.74
VSP-11	J1N0H4	12/19/2011	18.6	U	18.6	62.6		2.32	44.2		9.29	18.7		2.32
VSP-12	J1N0F2	12/16/2011	15.8	U	15.8	78.4		1.97	55.0		7.88	39.6		1.97
FS-5	J1N0D8	12/16/2011	40.8		18.6	51.0		2.32	54.3		9.28	19.5		2.32
Duplicate of J1N0D8	J1N0F0	12/16/2011	51.2		16.1	46.5		2.01	59.8		8.05	19.0		2.01
FS-1	J1N0H5	12/19/2011	8.82	B	13.5	61.5		1.68	210		6.73	15.0		1.68
SPLIT of J1N0H5	J1N0H7	12/19/2011	23.0	MN	0.0014	51.4		0.083	221	X	0.35	13.3		0.31
FS-2	J1N0D5	12/16/2011	27.6		15.5	49.0		1.94	57.2		7.76	17.0		1.94
FS-3	J1N0D4	12/16/2011	83.7		15.2	50.2		1.90	41.3		7.58	17.8		1.90
FS-4	J1N0H1	12/19/2011	40.9		13.5	68.4		1.69	49.0		6.75	19.9		1.69
FS-6	J1N0F8	12/16/2011	16.7	U	16.7	55.1		2.08	41.0		8.33	18.6		2.08
FS-7	J1N0F1	12/16/2011	14.7	B	17.5	46.2		2.19	38.2		8.77	10.9		2.19
FS-8	J1N0D7	12/16/2011	60.2		18.0	77.4		2.25	50.6		8.99	32.1		2.25
FS-9	J1N0D6	12/16/2011	5.65	B	17.3	74.7		2.16	47.1		8.64	25.1		2.16
FS-10	J1N0D3	12/16/2011	16.7	U	16.7	63.9		2.09	48.6		8.36	24.1		2.09
FS-11	J1N0D9	12/16/2011	150		14.9	70.8		1.87	45.2		7.47	25.2		1.87
FS-12	J1N0D0	12/16/2011	16.0	U	16.0	78.8		2.00	46.1		8.00	28.1		2.00
FS-13	J1N0D1	12/16/2011	10.4	B	14.4	56.0		1.80	42.3		7.20	24.1		1.80
FS-14	J1N0H3	12/19/2011	449		13.8	85.8		1.72	53.4		6.89	28.4		1.72
Equipment Blank	J1N0H6	12/19/2011	17.1	U	17.1	0.257	B	2.13	1.38	B	8.53	0.725	B	2.13

Attachment	1	Sheet No.	10 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Anions).

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite			Nitrogen in Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011	5.0	U	5.0	1.2	B	5.0	5.0	U	5.0	2.4	BJ	5.0	5.0	UR	5.0			
VSP-2	J1N0F3	12/16/2011	4.8	U	4.8	31.2		4.8	1.2	B	4.8	49.4	J	4.8	4.8	UR	4.8			
VSP-3	J1N0D2	12/16/2011	4.5	U	4.5	1.1	B	4.5	4.5	U	4.5	3.2	BJ	4.5	4.5	UR	4.5			
VSP-4	J1N0H2	12/19/2011	4.7	U	4.7	2.8	B	4.7	4.7	U	4.7	7.9		4.7	4.7	UR	4.7			
VSP-5	J1N0F9	12/16/2011	5.0	U	5.0	1.6	B	5.0	5.0	U	5.0	8.7		5.0	5.0	UR	5.0			
VSP-6	J1N0H0	12/19/2011	4.8	U	4.8	1.2	B	4.8	4.8	U	4.8	7.9		4.8	4.8	UR	4.8			
VSP-7	J1N0F5	12/16/2011	4.7	U	4.7	1.0	B	4.7	4.7	U	4.7	4.2	BJ	4.7	4.7	UR	4.7			
VSP-8	J1N0F4	12/16/2011	4.9	U	4.9	3.3	B	4.9	4.9	U	4.9	9.7	J	4.9	4.9	UR	4.9			
VSP-9	J1N0F6	12/16/2011	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.7	UR	4.7	4.7	UR	4.7			
VSP-10	J1N0F7	12/16/2011	4.8	U	4.8	2.9	B	4.8	4.8	U	4.8	7.2	J	4.8	4.8	UR	4.8			
VSP-11	J1N0H4	12/19/2011	4.8	U	4.8	1.3	B	4.8	4.8	U	4.8	10.6		4.8	4.8	UR	4.8			
VSP-12	J1N0F2	12/16/2011	5.0	U	5.0	108	D	10.0	5.0	U	5.0	7.3	J	5.0	5.0	UR	5.0			
FS-5	J1N0D8	12/16/2011	5.0	U	5.0	156	D	10.1	5.0	U	5.0	136	DJ	10.1	5.0	UR	5.0			
Duplicate of J1N0D8	J1N0F0	12/16/2011	4.6	U	4.6	29.2		4.6	4.6	U	4.6	22.0	J	4.6	4.6	UR	4.6			
FS-1	J1N0H5	12/19/2011	4.5	U	4.5	5.5		4.5	4.5	U	4.5	44.6		4.5	4.5	UR	4.5			
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.39	U	0.39	9.9		2.0	1.2	BN	0.82							16.0		0.31
FS-2	J1N0D5	12/16/2011	4.7	U	4.7	226	D	23.3	4.7	U	4.7	99.0	DJ	23.3	4.7	UR	4.7			
FS-3	J1N0D4	12/16/2011	4.9	U	4.9	2.5	B	4.9	4.9	U	4.9	1.9	BJ	4.9	4.9	UR	4.9			
FS-4	J1N0H1	12/19/2011	4.9	U	4.9	2.3	B	4.9	1.2	B	4.9	21.7		4.9	4.9	UR	4.9			
FS-6	J1N0F8	12/16/2011	4.8	U	4.8	4.4	B	4.8	4.8	U	4.8	8.0	J	4.8	4.8	UR	4.8			
FS-7	J1N0F1	12/16/2011	5.3	U	5.3	296	D	26.4	1.3	B	5.3	742	DJ	106	5.3	UR	5.3			
FS-8	J1N0D7	12/16/2011	4.5	U	4.5	17.0		4.5	6.7		4.5	29.0	J	4.5	4.5	UR	4.5			
FS-9	J1N0D6	12/16/2011	5.0	U	5.0	2.3	B	5.0	5.7		5.0	3.3	BJ	5.0	5.0	UR	5.0			
FS-10	J1N0D3	12/16/2011	4.4	U	4.4	1.8	B	4.4	4.4	U	4.4	12.5	J	4.4	4.4	UR	4.4			
FS-11	J1N0D9	12/16/2011	4.4	U	4.4	1.3	B	4.4	5.0		4.4	3.7	BJ	4.4	4.4	UR	4.4			
FS-12	J1N0D0	12/16/2011	4.8	U	4.8	1.1	B	4.8	1.0	B	4.8	1.9	BJ	4.8	4.8	UR	4.8			
FS-13	J1N0D1	12/16/2011	4.8	U	4.8	18.1		4.8	9.3		4.8	29.9	J	4.8	4.8	UR	4.8			
FS-14	J1N0H3	12/19/2011	4.7	U	4.7	1.1	B	4.7	9.8		4.7	2.7	B	4.7	4.7	UR	4.7			

Attachment	1	Sheet No.	11 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Anions).

Sample Location	HEIS Number	Sample Date	Nitrogen in Nitrite			Nitrogen in Nitrite and Nitrate			Phosphate			Phosphorous in phosphate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
VSP-1	J1N0C9	12/16/2011				0.67		0.50	2.2	BJ	10.0				3.0	BUJ	5.0
VSP-2	J1N0F3	12/16/2011				11.3	D	0.97	9.7	UR	9.7				58.7	J	4.8
VSP-3	J1N0D2	12/16/2011				0.76		0.45	9.0	UR	9.0				3.0	BUJ	4.5
VSP-4	J1N0H2	12/19/2011				1.95		0.47	9.3	UR	9.3				7.9		4.7
VSP-5	J1N0F9	12/16/2011				2.08		0.50	10.0	UR	10.0				8.5		5.0
VSP-6	J1N0H0	12/19/2011				1.90		0.48	9.6	UR	9.6				11.9		4.8
VSP-7	J1N0F5	12/16/2011				0.98		0.47	9.5	UR	9.5				8.2	UR	4.7
VSP-8	J1N0F4	12/16/2011				2.22		0.49	9.8	UR	9.8				10.7	UJ	4.9
VSP-9	J1N0F6	12/16/2011				0.14	BJ	0.47	9.4	UR	9.4				5.1	UJ	4.7
VSP-10	J1N0F7	12/16/2011				1.64		0.48	2.0	BJ	9.5				10.9	UJ	4.8
VSP-11	J1N0H4	12/19/2011				2.57		0.48	2.3	B	9.7				8.7		4.8
VSP-12	J1N0F2	12/16/2011				1.67		0.50	10.0	UR	10.0				22.3	J	5.0
FS-5	J1N0D8	12/16/2011				32.2	D	2.52	10.1	UR	10.1				183	DJ	10.1
Duplicate of J1N0D8	J1N0F0	12/16/2011				5.04		0.46	1.9	BJ	9.2				53.1	J	4.6
FS-1	J1N0H5	12/19/2011				10.5	D	0.90	3.4	B	9.0				23.0		4.5
SPLIT of J1N0H5	J1N0H7	12/19/2011	0.34	U	0.34	6.5	N	0.30				6.8		1.2	34.3		1.7
FS-2	J1N0D5	12/16/2011				23.8	D	2.33	9.3	UR	9.3				234	DJ	23.3
FS-3	J1N0D4	12/16/2011				0.43	B	0.49	2.1	BJ	9.9				6.8	UJ	4.9
FS-4	J1N0H1	12/19/2011				5.20		0.49	5.2	B	9.7				33.1		4.9
FS-6	J1N0F8	12/16/2011				1.83		0.48	9.7	UR	9.7				24.6	J	4.8
FS-7	J1N0F1	12/16/2011				173	D	26.4	10.6	UR	10.6				933	DJ	106
FS-8	J1N0D7	12/16/2011				6.59		0.45	9.0	UR	9.0				35.6	J	4.5
FS-9	J1N0D6	12/16/2011				0.81		0.50	10.1	UR	10.1				27.5	J	5.0
FS-10	J1N0D3	12/16/2011				3.00		0.44	8.9	UR	8.9				9.3	UJ	4.4
FS-11	J1N0D9	12/16/2011				0.82		0.44	8.8	UR	8.8				6.5	UJ	4.4
FS-12	J1N0D0	12/16/2011				0.37	B	0.48	9.7	UR	9.7				4.5	BUJ	4.8
FS-13	J1N0D1	12/16/2011				6.98		0.48	9.6	UR	9.6				41.9	J	4.8
FS-14	J1N0H3	12/19/2011				0.68		0.47	2.4	B	9.4				4.9		4.7

Attachment	1	Sheet No.	12 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Sites Verification Sample Results (Physical).

Sample Location	HEIS Number	Sample Date	Percent moisture (wet sample)			Percent Solid			pH measurement		
			%	Q	PQL	%	Q	PQL	%	Q	PQL
VSP-1	J1N0C9	12/16/2011				98.2		0.1	8.78		0.10
VSP-2	J1N0F3	12/16/2011				97.7		0.1	9.08	J	0.10
VSP-3	J1N0D2	12/16/2011				97.1		0.1	9.31	J	0.10
VSP-4	J1N0H2	12/19/2011				97.5		0.1	9.36		0.10
VSP-5	J1N0F9	12/16/2011				97.5		0.1	9.32		0.10
VSP-6	J1N0H0	12/19/2011				98.7		0.1	9.25		0.10
VSP-7	J1N0F5	12/16/2011				98.5		0.1	9.32	J	0.10
VSP-8	J1N0F4	12/16/2011				97.3		0.1	9.22	J	0.10
VSP-9	J1N0F6	12/16/2011				98.5		0.1	9.20	J	0.10
VSP-10	J1N0F7	12/16/2011				96.9		0.1	9.14	J	0.10
VSP-11	J1N0H4	12/19/2011				97.9		0.1	9.14		0.10
VSP-12	J1N0F2	12/16/2011				94.7		0.1	8.77	J	0.10
FS-5	J1N0D8	12/16/2011				97.9		0.1	8.20	J	0.10
Duplicate of J1N0D8	J1N0F0	12/16/2011				97.1		0.1	9.44	J	0.10
FS-1	J1N0H5	12/19/2011				99.0		0.1	7.11		0.10
SPLIT of J1N0H5	J1N0H7	12/19/2011	1.8		0.10				7.41		0.0100
FS-2	J1N0D5	12/16/2011				97.6		0.1	8.42	J	0.10
FS-3	J1N0D4	12/16/2011				98.4		0.1	8.40	J	0.10
FS-4	J1N0H1	12/19/2011				96.2		0.1	9.07		0.10
FS-6	J1N0F8	12/16/2011				96.8		0.1	9.30	J	0.10
FS-7	J1N0F1	12/16/2011				91.9		0.1	8.56	J	0.10
FS-8	J1N0D7	12/16/2011				97.6		0.1	9.35	J	0.10
FS-9	J1N0D6	12/16/2011				96.5		0.1	9.22	J	0.10
FS-10	J1N0D3	12/16/2011				98.0		0.1	9.22	J	0.10
FS-11	J1N0D9	12/16/2011				98.4		0.1	9.59	J	0.10
FS-12	J1N0D0	12/16/2011				97.6		0.1	9.45	J	0.10
FS-13	J1N0D1	12/16/2011				97.9		0.1	9.49	J	0.10
FS-14	J1N0H3	12/19/2011				98.1		0.1	9.74		0.10
EB	J1N0H6	12/19/2011				99.3		0.1			

Attachment	1	Sheet	13 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0C9, VSP-1			J1N0F3, VSP-2			J1N0D2, VSP-3			J1N0H2, VSP-4		
		12/16/11 12:25			12/16/11 14:02			12/16/11 12:47			12/19/11 9:56		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1221	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1232	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1242	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1248	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1254	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1260	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1262	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
Aroclor-1268	PCB	13.4	UJ	13.4	13.5	U	13.5	13.6	U	13.6	13.6	U	13.6
1,1,1-Trichloroethane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,1,2,2-Tetrachloroethane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,1,2-Trichloroethane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,1-Dichloroethane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,1-Dichloroethene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,2-Dichloroethane	VOA	6.02	U	6.02	4.81	U	4.81	7.46	U	7.46	4.89	U	4.89
1,2-Dichloroethene(Total)	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
1,2-Dichloropropane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
2-Butanone	VOA	12.0	U	12.0	9.62	U	9.62	14.9	U	14.9	9.78	U	9.78
2-Hexanone	VOA	12.0	U	12.0	9.62	U	9.62	14.9	U	14.9	9.78	U	9.78
4-Methyl-2-Pentanone	VOA	12.0	U	12.0	9.62	U	9.62	14.9	U	14.9	9.78	U	9.78
Acetone	VOA	12.0	U	12.0	9.62	U	9.62	14.9	U	14.9	3.46	J	9.78
Benzene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Bromodichloromethane	VOA	6.02	U	6.02	4.81	U	4.81	7.46	U	7.46	4.89	U	4.89
Bromoform	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Bromomethane	VOA	10.0	U	10.0	8.02	U	8.02	12.4	U	12.4	8.15	U	8.15
Carbon disulfide	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Carbon tetrachloride	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Chlorobenzene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Chloroethane	VOA	10.0	U	10.0	8.02	U	8.02	12.4	U	12.4	8.15	U	8.15
Chloroform	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Chloromethane	VOA	10.0	U	10.0	8.02	U	8.02	12.4	U	12.4	8.15	U	8.15
cis-1,2-Dichloroethylene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
cis-1,3-Dichloropropene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Dibromochloromethane	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Ethylbenzene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Methylenechloride	VOA	6.02	U	6.02	4.81	U	4.81	7.46	U	7.46	4.89	U	4.89
Styrene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Tetrachloroethene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Toluene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
trans-1,2-Dichloroethylene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
trans-1,3-Dichloropropene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Trichloroethene	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07
Vinyl chloride	VOA	10.0	U	10.0	8.02	U	8.02	12.4	U	12.4	8.15	U	8.15
Xylenes (total)	VOA	5.02	U	5.02	4.01	U	4.01	6.22	U	6.22	4.07	U	4.07

Attachment	1	Sheet No.	14 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. 300-6 and Associated Waste Sites Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0F9, VSP-5			J1N0H0, VSP-6			J1N0F5, VSP-7			J1N0F4, VSP-8		
		12/16/2011			12/19/2011			12/16/2011			12/16/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1221	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1232	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1242	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1248	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1254	PCB	13.4	U	13.4	13.1	U	13.1	8.42	J	13.3	13.5	U	13.5
Aroclor-1260	PCB	13.4	U	13.4	13.1	U	13.1	12.9	J	13.3	3.61	J	13.5
Aroclor-1262	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
Aroclor-1268	PCB	13.4	U	13.4	13.1	U	13.1	13.3	U	13.3	13.5	U	13.5
1,1,1-Trichloroethane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,1,2,2-Tetrachloroethane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,1,2-Trichloroethane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,1-Dichloroethane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,1-Dichloroethene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,2-Dichloroethane	VOA	8.18	U	8.18	6.01	U	6.01	6.00	U	6.00	5.65	U	5.65
1,2-Dichloroethene(Total)	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
1,2-Dichloropropane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
2-Butanone	VOA	16.4	U	16.4	12.0	U	12.0	12.0	U	12.0	11.3	U	11.3
2-Hexanone	VOA	16.4	U	16.4	12.0	U	12.0	12.0	U	12.0	11.3	U	11.3
4-Methyl-2-Pentanone	VOA	16.4	U	16.4	12.0	U	12.0	12.0	U	12.0	11.3	U	11.3
Acetone	VOA	7.43	J	16.4	4.96	J	12.0	12.0	U	12.0	11.3	U	11.3
Benzene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Bromodichloromethane	VOA	8.18	U	8.18	6.01	U	6.01	6.00	U	6.00	5.65	U	5.65
Bromoform	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Bromomethane	VOA	13.6	U	13.6	10.0	U	10.0	9.99	U	9.99	9.41	U	9.41
Carbon disulfide	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Carbon tetrachloride	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Chlorobenzene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Chloroethane	VOA	13.6	U	13.6	10.0	U	10.0	9.99	U	9.99	9.41	U	9.41
Chloroform	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Chloromethane	VOA	13.6	U	13.6	10.0	U	10.0	9.99	U	9.99	9.41	U	9.41
cis-1,2-Dichloroethylene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
cis-1,3-Dichloropropene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Dibromochloromethane	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Ethylbenzene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Methylenechloride	VOA	8.18	U	8.18	6.01	U	6.01	2.45	J	6.00	5.65	U	5.65
Styrene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Tetrachloroethene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Toluene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
trans-1,2-Dichloroethylene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
trans-1,3-Dichloropropene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Trichloroethene	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71
Vinyl chloride	VOA	13.6	U	13.6	10.0	U	10.0	9.99	U	9.99	9.41	U	9.41
Xylenes (total)	VOA	6.82	U	6.82	5.01	U	5.01	5.00	U	5.00	4.71	U	4.71

Attachment	1	Sheet No.	15 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. 300-6 and Associated Waste Sites Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0F6, VSP-9			J1N0F7, VSP-10			J1N0H4, VSP-11			J1N0F2, VSP-12		
		12/16/2011			12/16/2011			12/19/2011			12/16/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1221	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1232	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1242	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1248	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1254	PCB	4.16	J	13.4	7.78	J	13.4	6.12	J	13.4	25.5		13.9
Aroclor-1260	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	11.6	J	13.9
Aroclor-1262	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
Aroclor-1268	PCB	13.4	U	13.4	13.4	U	13.4	13.4	U	13.4	13.9	U	13.9
1,1,1-Trichloroethane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,1,2,2-Tetrachloroethane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,1,2-Trichloroethane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,1-Dichloroethane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,1-Dichloroethene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,2-Dichloroethane	VOA	6.41	U	6.41	5.60	U	5.60	6.09	U	6.09	5.64	U	5.64
1,2-Dichloroethene(Total)	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
1,2-Dichloropropane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
2-Butanone	VOA	12.8	U	12.8	11.2	U	11.2	12.2	U	12.2	11.3	U	11.3
2-Hexanone	VOA	12.8	U	12.8	11.2	U	11.2	12.2	U	12.2	11.3	U	11.3
4-Methyl-2-Pentanone	VOA	12.8	U	12.8	11.2	U	11.2	12.2	U	12.2	11.3	U	11.3
Acetone	VOA	12.8	U	12.8	11.2	U	11.2	12.2	U	12.2	11.3	U	11.3
Benzene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Bromodichloromethane	VOA	6.41	U	6.41	5.60	U	5.60	6.09	U	6.09	5.64	U	5.64
Bromoform	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Bromomethane	VOA	10.7	U	10.7	9.33	U	9.33	10.2	U	10.2	9.39	U	9.39
Carbon disulfide	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Carbon tetrachloride	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Chlorobenzene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Chloroethane	VOA	10.7	U	10.7	9.33	U	9.33	10.2	U	10.2	9.39	U	9.39
Chloroform	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Chloromethane	VOA	10.7	U	10.7	9.33	U	9.33	10.2	U	10.2	9.39	U	9.39
cis-1,2-Dichloroethylene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
cis-1,3-Dichloropropene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Dibromochloromethane	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Ethylbenzene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Methylenechloride	VOA	6.41	U	6.41	5.60	U	5.60	6.09	U	6.09	5.64	U	5.64
Styrene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Tetrachloroethene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Toluene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
trans-1,2-Dichloroethylene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
trans-1,3-Dichloropropene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Trichloroethene	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70
Vinyl chloride	VOA	10.7	U	10.7	9.33	U	9.33	10.2	U	10.2	9.39	U	9.39
Xylenes (total)	VOA	5.34	U	5.34	4.67	U	4.67	5.08	U	5.08	4.70	U	4.70

Attachment	1	Sheet No.	16 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0D8, FS-5			J1N0F0, Duplicate of FS-5			J1N0H5, FS-1			J1N0H7, Split of J1N0H5		
		12/16/11 13:17			12/16/11 13:26			12/19/11 10:38			12/19/11 10:39		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9	14	UD	14
Aroclor-1221	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9	40	UD	40
Aroclor-1232	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9	10	UD	10
Aroclor-1242	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9	23	UD	23
Aroclor-1248	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9	23	UD	23
Aroclor-1254	PCB	26.0		13.3	46.4		13.5	735	D	66.9	560	D	13
Aroclor-1260	PCB	27.8		13.3	35.7		13.5	209	D	66.9	330	D	13
Aroclor-1262	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9			
Aroclor-1268	PCB	13.3	U	13.3	13.5	U	13.5	66.9	UD	66.9			
1,1,1-Trichloroethane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.62	UX	0.62
1,1,2,2-Tetrachloroethane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.73	U	0.73
1,1,2-Trichloroethane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	1.1	UX	1.1
1,1-Dichloroethane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.25	UX	0.25
1,1-Dichloroethene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.71	UX	0.71
1,2-Dichloroethane	VOA	6.18	U	6.18	6.35	U	6.35	5.69	U	5.69	0.84	UX	0.84
1,2-Dichloroethene(Total)	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.47	UX	0.47
1,2-Dichloropropane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.66	UX	0.66
2-Butanone	VOA	12.4	U	12.4	12.7	U	12.7	11.4	U	11.4	2.2	U	2.2
2-Hexanone	VOA	12.4	U	12.4	12.7	U	12.7	11.4	U	11.4	5.9	U	5.9
4-Methyl-2-Pentanone	VOA	12.4	U	12.4	12.7	U	12.7	11.4	U	11.4	5.2	U	5.2
Acetone	VOA	5.54	J	12.4	12.7	U	12.7	4.84	J	11.4	6.4	U	6.4
Benzene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.56	UX	0.56
Bromodichloromethane	VOA	6.18	U	6.18	6.35	U	6.35	5.69	U	5.69	0.26	UX	0.26
Bromoform	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.28	UX	0.28
Bromomethane	VOA	10.3	U	10.3	10.6	U	10.6	9.49	U	9.49	0.60	U	0.60
Carbon disulfide	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.50	UX	0.50
Carbon tetrachloride	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.75	UX	0.75
Chlorobenzene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.65	UX	0.65
Chloroethane	VOA	10.3	U	10.3	10.6	U	10.6	9.49	U	9.49	1.1	U	1.1
Chloroform	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.35	UX	0.35
Chloromethane	VOA	10.3	U	10.3	10.6	U	10.6	9.49	U	9.49	0.92	U	0.92
cis-1,2-Dichloroethylene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74			
cis-1,3-Dichloropropene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	1.5	UX	1.5
Dibromochloromethane	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.68	UX	0.68
Ethylbenzene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.80	UX	0.80
Methylenechloride	VOA	6.18	U	6.18	6.35	U	6.35	5.69	U	5.69	0.90	UX	0.90
Styrene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.75	UX	0.75
Tetrachloroethene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.71	UX	0.71
Toluene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.83	UX	0.83
trans-1,2-Dichloroethylene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74			
trans-1,3-Dichloropropene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.80	UX	0.80
Trichloroethene	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.28	UX	0.28
Vinyl chloride	VOA	10.3	U	10.3	10.6	U	10.6	9.49	U	9.49	1.6	U	1.6
Xylenes (total)	VOA	5.15	U	5.15	5.29	U	5.29	4.74	U	4.74	0.73	UX	0.73

Attachment	1	Sheet No.	17 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0D4, FS-3			J1N0H1, FS-4			J1N0F8, FS-6			J1N0F1, FS-7		
		12/16/11 12:56			12/19/11 9:38			12/16/11 14:13			12/16/11 12:49		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1221	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1232	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1242	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1248	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1254	PCB	47.7		13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1260	PCB	19.9		13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1262	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
Aroclor-1268	PCB	13.2	U	13.2	13.8	U	13.8	13.6	U	13.6	14.3	U	14.3
1,1,1-Trichloroethane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,1,2,2-Tetrachloroethane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,1,2-Trichloroethane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,1-Dichloroethane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,1-Dichloroethene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,2-Dichloroethane	VOA	6.18	U	6.18	5.92	U	5.92	6.41	U	6.41	6.45	U	6.45
1,2-Dichloroethene(Total)	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
1,2-Dichloropropane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
2-Butanone	VOA	12.4	U	12.4	11.8	U	11.8	12.8	U	12.8	12.9	U	12.9
2-Hexanone	VOA	12.4	U	12.4	11.8	U	11.8	12.8	U	12.8	12.9	U	12.9
4-Methyl-2-Pentanone	VOA	12.4	U	12.4	11.8	U	11.8	12.8	U	12.8	12.9	U	12.9
Acetone	VOA	12.4	U	12.4	4.59	J	11.8	12.8	U	12.8	12.9	U	12.9
Benzene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Bromodichloromethane	VOA	6.18	U	6.18	5.92	U	5.92	6.41	U	6.41	6.45	U	6.45
Bromoform	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Bromomethane	VOA	10.3	U	10.3	9.86	U	9.86	10.7	U	10.7	10.7	U	10.7
Carbon disulfide	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Carbon tetrachloride	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Chlorobenzene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Chloroethane	VOA	10.3	U	10.3	9.86	U	9.86	10.7	U	10.7	10.7	U	10.7
Chloroform	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Chloromethane	VOA	10.3	U	10.3	9.86	U	9.86	10.7	U	10.7	10.7	U	10.7
cis-1,2-Dichloroethylene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
cis-1,3-Dichloropropene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Dibromochloromethane	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Ethylbenzene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Methylenechloride	VOA	6.18	U	6.18	5.92	U	5.92	6.41	U	6.41	6.45	U	6.45
Styrene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Tetrachloroethene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Toluene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
trans-1,2-Dichloroethylene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
trans-1,3-Dichloropropene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Trichloroethene	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37
Vinyl chloride	VOA	10.3	U	10.3	9.86	U	9.86	10.7	U	10.7	10.7	U	10.7
Xylenes (total)	VOA	5.15	U	5.15	4.93	U	4.93	5.34	U	5.34	5.37	U	5.37

Attachment	1	Sheet No.	18 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0D5, FS-2			J1N0D7, FS-8			J1N0D6, FS-9			J1N0D3, FS-10		
		12/16/11 13:02			12/16/2011			12/16/2011			12/16/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1221	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1232	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1242	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1248	PCB	13.4	U	13.4	35.8		13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1254	PCB	123		13.4	44.4		13.4	13.6	U	13.6	9.69	J	13.2
Aroclor-1260	PCB	46.6		13.4	5.80	J	13.4	13.6	U	13.6	4.25	J	13.2
Aroclor-1262	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
Aroclor-1268	PCB	13.4	U	13.4	13.4	U	13.4	13.6	U	13.6	13.2	U	13.2
1,1,1-Trichloroethane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,1,2,2-Tetrachloroethane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,1,2-Trichloroethane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,1-Dichloroethane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,1-Dichloroethene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,2-Dichloroethane	VOA	6.33	U	6.33	7.39	U	7.39	6.32	U	6.32	7.10	U	7.10
1,2-Dichloroethene(Total)	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
1,2-Dichloropropane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
2-Butanone	VOA	12.7	U	12.7	14.8	U	14.8	12.6	U	12.6	14.2	U	14.2
2-Hexanone	VOA	12.7	U	12.7	14.8	U	14.8	12.6	U	12.6	14.2	U	14.2
4-Methyl-2-Pentanone	VOA	12.7	U	12.7	14.8	U	14.8	12.6	U	12.6	14.2	U	14.2
Acetone	VOA	12.7	U	12.7	14.8	U	14.8	12.6	U	12.6	14.2	U	14.2
Benzene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Bromodichloromethane	VOA	6.33	U	6.33	7.39	U	7.39	6.32	U	6.32	7.10	U	7.10
Bromoform	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Bromomethane	VOA	10.5	U	10.5	12.3	U	12.3	10.5	U	10.5	11.8	U	11.8
Carbon disulfide	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Carbon tetrachloride	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Chlorobenzene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Chloroethane	VOA	10.5	U	10.5	12.3	U	12.3	10.5	U	10.5	11.8	U	11.8
Chloroform	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Chloromethane	VOA	10.5	U	10.5	12.3	U	12.3	10.5	U	10.5	11.8	U	11.8
cis-1,2-Dichloroethylene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
cis-1,3-Dichloropropene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Dibromochloromethane	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Ethylbenzene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Methylenechloride	VOA	6.33	U	6.33	7.39	U	7.39	6.32	U	6.32	7.10	U	7.10
Styrene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Tetrachloroethene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Toluene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
trans-1,2-Dichloroethylene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
trans-1,3-Dichloropropene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Trichloroethene	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92
Vinyl chloride	VOA	10.5	U	10.5	12.3	U	12.3	10.5	U	10.5	11.8	U	11.8
Xylenes (total)	VOA	5.27	U	5.27	6.16	U	6.16	5.27	U	5.27	5.92	U	5.92

Attachment	1	Sheet No.	19 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Attachment 1. UPR-300-38, 313 ESSP, and 300-270 Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1N0D9, FS-11			J1N0D0, FS-12			J1N0D1, FS-13			J1N0H3, FS-14		
		12/16/2011			12/16/2011			12/16/2011			12/19/2011		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Aroclor-1016	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
Aroclor-1221	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
Aroclor-1232	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
Aroclor-1242	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
Aroclor-1248	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	4.24	J	13.2
Aroclor-1254	PCB	7.06	J	13.4	13.4	U	13.4	13.5	U	13.5	17.3		13.2
Aroclor-1260	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	3.41	J	13.2
Aroclor-1262	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
Aroclor-1268	PCB	13.4	U	13.4	13.4	U	13.4	13.5	U	13.5	13.2	U	13.2
1,1,1-Trichloroethane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,1,2,2-Tetrachloroethane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,1,2-Trichloroethane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,1-Dichloroethane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,1-Dichloroethene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,2-Dichloroethane	VOA	7.28	U	7.28	7.02	U	7.02	6.54	U	6.54	7.32	U	7.32
1,2-Dichloroethene(Total)	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
1,2-Dichloropropane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
2-Butanone	VOA	14.6	U	14.6	14.0	U	14.0	13.1	U	13.1	14.6	U	14.6
2-Hexanone	VOA	14.6	U	14.6	14.0	U	14.0	13.1	U	13.1	14.6	U	14.6
4-Methyl-2-Pentanone	VOA	14.6	U	14.6	14.0	U	14.0	13.1	U	13.1	14.6	U	14.6
Acetone	VOA	14.6	U	14.6	14.0	U	14.0	13.1	U	13.1	14.6	U	14.6
Benzene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Bromodichloromethane	VOA	7.28	U	7.28	7.02	U	7.02	6.54	U	6.54	7.32	U	7.32
Bromoform	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Bromomethane	VOA	12.1	U	12.1	11.7	U	11.7	10.9	U	10.9	12.2	U	12.2
Carbon disulfide	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Carbon tetrachloride	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Chlorobenzene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Chloroethane	VOA	12.1	U	12.1	11.7	U	11.7	10.9	U	10.9	12.2	U	12.2
Chloroform	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Chloromethane	VOA	12.1	U	12.1	11.7	U	11.7	10.9	U	10.9	12.2	U	12.2
cis-1,2-Dichloroethylene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
cis-1,3-Dichloropropene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Dibromochloromethane	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Ethylbenzene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Methylenechloride	VOA	7.28	U	7.28	7.02	U	7.02	6.54	U	6.54	7.32	U	7.32
Styrene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Tetrachloroethene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Toluene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
trans-1,2-Dichloroethylene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
trans-1,3-Dichloropropene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Trichloroethene	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10
Vinyl chloride	VOA	12.1	U	12.1	11.7	U	11.7	10.9	U	10.9	12.2	U	12.2
Xylenes (total)	VOA	6.06	U	6.06	5.85	U	5.85	5.45	U	5.45	6.10	U	6.10

Attachment	1	Sheet No.	20 of 20
Originator	N. K. Schiffern	Date	2/27/12
Checked	J. D. Skoglie	Date	2/27/12
Calc. No.	0300X-CA-V0152	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 300 Area Field Remediation **Job No. 14655**

Area: 300

Discipline: Environmental *Calculation No: 0300X-CA-V0154

Subject: UPR-300-38, 313 ESSP, 300-270 Sites 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 = 4 Total = 5	N. K. Schiffern N. K. Schiffern	I. B. Berezovskiy I. B. Berezovskiy	J. D. Skoglie J. D. Skoglie 5/1/12	~~T. Tadowise~~ M. L. Proctor M. L. Proctor	5/1/12

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	02/27/12	Calc. No.:	0300X-CA-V0154	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	02/27/12
Subject:	UPR-300-38, 313 ESSP, and 300-270 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 4

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the UPR-300-38, 313 ESSP, and 300-270 waste sites. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

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

GIVEN/REFERENCES:

1) DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 300 Area,* DOE/RL-2001-47, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2011, 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 3, 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, *UPR-300-38, 313 ESSP, and 300-270 Waste Site Cleanup Verification 95% UCL Calculation*, 0300X-CA-V0152, Rev. 0, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	03/06/12	Calc. No.:	0300X-CA-V0154	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	03/06/12
Subject:	UPR-300-38, 313 ESSP, and 300-270 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 4

METHODOLOGY:

The UPR-300-38, 313 ESSP, and 300-270 waste sites are comprised of two decision units for verification sampling. The direct contact hazard quotient and carcinogenic risk calculations for the UPR-300-38, 313 ESSP, and 300-270 waste sites were conservatively calculated for the entire waste site using the greater of the statistical or maximum value for each analyte in all decision units from WCH (2012). Of the contaminants of potential concern (COPCs) for this site, copper, lead, uranium, vanadium, zinc, and the detected anions are included because they are quantitated at concentrations above Hanford Site background. Boron, molybdenum, PCBs, and volatiles require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Arsenic was detected above background; however, arsenic cleanup level is not toxicity based, and therefore HQ and risk calculations for arsenic are not performed. Lead was detected above background; however, lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-lead levels rather than exposure levels or daily intake. All other site nonradionuclide COPCs were not detected or were quantified below background levels. Due to an exceedance of the residential carcinogenic risk criteria for aroclor-1254 and HQ for uranium, the entire data set was evaluated against the industrial HQ and risk standard. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 1.58 mg/kg, divided by the noncarcinogenic RAG value of 700,000 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 2.3×10^{-6}. 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 9.0×10^{-1}. 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 1.0×10^{-6}. For example, the maximum value for aroclor-1248 is 0.0358 mg/kg, divided by 65.6 mg/kg, and multiplied as indicated, is 5.5×10^{-10}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 1.5×10^{-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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	03/06/12	Calc. No.:	0300X-CA-V0154	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	03/06/12
Subject:	UPR-300-38, 313 ESSP, and 300-270 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 4

Table 1 shows the results of the calculations.

Table 1. Industrial Direct Contact Hazard Quotient and Excess Cancer Risk Results for the UPR-300-38, 313 ESSP, and 300-270 Waste Sites

Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Industrial Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Industrial Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Arsenic [c]	12.5	24	--	0.667	--
Boron	1.58	700,000	2.3E-06	--	--
Copper	91.3	130,000	7.0E-04	--	--
Lead	76.7	1,000	--	--	--
Molybdenum	0.996	17,500	5.7E-05	--	--
Uranium	449	505	8.9E-01	--	--
Vanadium	85.8	24,500	3.5E-03	--	--
Zinc	210	1,050,000	2.0E-04	--	--
Anions					
Fluoride	9.8	210,000	4.7E-05	--	--
Nitrogen in Nitrate and Nitrite	173	5,600,000	3.1E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1248	0.0358	--	--	65.6	5.5E-10
Aroclor-1254	0.735	70.0	1.1E-02	65.6	1.1E-08
Aroclor-1260	0.209	--	--	65.6	3.2E-09
Volatiles					
Acetone	0.00743	3,150,000	2.4E-09	--	--
Methylenechloride	0.00245	210,000	1.2E-08	17,500	1.4E-13
Totals					
Cumulative Hazard Quotient:			**9.0E-01**		
Cumulative Excess Cancer Risk:					**1.5E-08**

Notes:

[a] = From WCH (2012).

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

[c] = The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009a).

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	N. K. Schiffern	Date:	02/27/12	Calc. No.:	0300X-CA-V0154	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	02/27/12
Subject:	UPR-300-38, 313 ESSP, and 300-270 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	4 of 4

CONCLUSION:

The calculations in Table 1 demonstrate that the UPR-300-38, 313 ESSP, and 300-270 waste sites meet the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009) and SAP (DOE-RL 2011). The direct contact hazard quotients and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

CALCULATION COVER SHEET

Project Title: 300 Area Field Remediation **Job No. 14655**

Area: 300 Area

Discipline: Environmental *Calculation No: 0300X-CA-V0155

Subject: UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations

Computer Program: RESRAD Program No: Version 6.5

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 pg Summary – 3 pg Attm. 1 - 26 pg Attm. 2 - 17 pg Total – 47 pages	M. W. Perrott	S.W. Clark	NA	J.D. Ludowise	3-12-2012

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:	M. W. Perrott	Date:	3/7/12	Calc. No.:	0300X-CA-V0155	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	S. W. Clark	Date:	3/7/12
Subject:	UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations					Sheet No. 1 of 13	

akb 3·13·12

PURPOSE:

Perform a RESRAD calculations of the radiological dose, over a period of 1,000 years, from radionuclide activities at focused sampling locations within the UPR-300-38 waste site. Specifically, the sum of fractions evaluation of radionuclide dose exceeded the 15 mrem/yr dose limitation at sample location FS-11.

GIVEN/REFERENCES:

1) Focused and statistical samples were collected within the excavation of the UPR-300-38, 313 EESP, and 300-270 waste sites. Sum of fractions evaluations described in Appendix G of the *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, performed for focused sample FS-11, collected within the UPR-300-38 waste site, exceeded the15 mrem/yr radiological dose limitation. Therefore, the analyses were evaluated by site-specific RESidual RADioactivity (RESRAD) modeling for radionuclides as described in Appendix B of the *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. Site-specific RESRAD calculations were performed 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.
2) For the purpose of performing RESRAD calculations on the contaminants of the UPR-300-38 soils cleanup verification focused sampling site FS-11, the radionuclide focused sampling analyses of were obtained from the *UPR-300-38, 313 EESP, and 300-270 Waste Sites Cleanup Verification 95% UCL Calculations* (95% UCL), Calc. No. 0300X-CA-V0152, Rev. 0, Washington Closure Hanford, Richland, Washington.
3) The RESidual RADioactivity (RESRAD) computer code, version 6.5, was developed for the U.S. Department of Energy by the Environmental Assessment Division of Argonne National Laboratory, Argonne, Illinois, to calculate compliance with residual radioactivity guidelines and may be accessed at < http://www.ead.anl.gov/resrad >..
4) The verification sample design is available from the *Work Instruction for Verification Sampling of the UPR-300-38, Soil Contamination Beneath the 313 Building, 313 ESSP, 313 East Side Storage Pad, and 300-270, Unplanned Release at 313 Building*, Work Instruction No. 0300X-WI-G0019, Rev. 0, Washington Closure Hanford, Richland, Washington.
5) Groundwater elevations for determination of vadose zone thickness for RESRAD calculations were obtained from *Hanford Groundwater Monitoring for Fiscal Year 2009*, DOE/RL-2010-11, Rev. 1, U.S. Department of Energy, Richland, Washington.

SOLUTION:

1) Individual RESRAD runs were performed for focused sampling location FS-11. RESRAD evaluation of the FS-11 sampling location has been conducted using shallow zone criteria throughout so all-pathways radiological dose was evaluated as well as groundwater and river protection criteria. Table 1 shows the area, elevation (NAVD88) and thickness of each soil horizon. Acceptable radiological readings obtained at adjacent focused sampling location

Washington Closure Hanford CALCULATION SHEET

Originator:	M. W. Perrott	Date:	3/7/12	Calc. No.:	0300X-CA-V0155	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	S. W. Clark	Date:	3/7/12
Subject:	UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations					Sheet No. 2 of 13	

were used to determine the area of influence associated with the FS-11 sample data. Table 2 shows the radionuclide analyses used in the RESRAD evaluations for each focused sample. Input factors for each run are shown in the "Summary" sections of the RESRAD "Mixture Sums and Single Radionuclide Guidelines" printouts in Attachment 1 to this Calculation Summary.

Parameter	Units	Focused Sample FS-11
Cover Depth	m	0
Area of Contaminated Zone (CZ)	m^2	30
Length Parallel to Aquifer Flow	m	8
Elevation: Surface	m	119.0
Elevation: Groundwater	m	105.3
Thickness: Contaminated Zone	m	1
Thickness: Unsaturated Zone	m	12.7

Radionuclide	Focused Sample FS-13		
	pCi/g	Q	MDA
Americium-241	0.372	U	0.372
Cesium-137	0.028	U	0.028
Cobalt-60	0.023	U	0.023
Europium-152	0.079	U	0.079
Europium-154	0.081	U	0.081
Europium-155	0.158	U	0.158
Strontium-90	-0.030	U	0.362
Uranium-233/234	121		0.714
Uranium-235	8.23	J	0.232
Uranium-238	116		0.681

2) The year when the peak dose (or concentration) occurs from each individual radionuclide COC and layer was determined by a preliminary run. This year was then added for all horizons for the final RESRAD runs. For the direct exposure pathway (i.e. soil ingestion and inhalation and external radiation), the peak year occurred at year zero (year 2012) for all of the radionuclide COPCs. For the water pathways, no dose was predicted from the detected radionuclides within 1,000 years.

METHODOLOGY:

1) Runs of RESRAD version 6.5 were completed for the UPR-300-38 soil cleanup verification focused sampling analyses for the radionuclides in Table 2. RESRAD numerical output

Washington Closure Hanford CALCULATION SHEET

Originator:	M. W. Perrott	Date:	3/7/12	Calc. No.:	0300X-CA-V0155	Rev.:	0
Project:	300 Area Field Remediation	Job No:	14655	Checked:	S. W. Clark	Date:	3/7/12
Subject:	UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations					Sheet No. 3 of 13	

akb 3-13-12

reports for dose and concentration are presented in the Attachments to this calculation summary.

RESULTS:

1) Radionuclide "All Pathways" Dose Rate

The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate for focused sample FS-11 is 12.4 mrem/yr at year zero (2012) which is below the dose limitation of 15 mrem/yr.

Table 3. All Pathways Dose Rate (mrem/yr) 12

RESRAD Run	Vadose Zone Horizons	"All Pathways" Dose Contributions in mrem/yr at Each Time Slice (yr)						
		0	1	3	10	30	100	1000
Focused Sample FS-11	Shallow Zone	1.24E+01	1.23E+01	1.22E+01	1.18E+01	1.11E+01	9.71E+00	2.34E+00

2) Radionuclide Groundwater Protection

None of the radionuclides associated with sample data collected from the FS-11 location were predicted to migrate to groundwater within 1000 years. Calculation of cumulative organ specific dose via the groundwater (and river) pathway is therefore not necessary.

CONCLUSIONS:

- The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate for sample FS-11 is 12.4 mrem/yr at year zero (2012) which is below the dose limitation of 15 mrem/yr.
-
- The dominant pathway for the RESRAD evaluations dose rate for soils associated with the FS-11 sample is direct exposure due to uranium-238.

ATTACHMENTS:

1. RESRAD Output: UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11 – Mixture Sums and Single Radionuclide Guidelines (26 pages).

2. RESRAD Output: UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11 – Concentration of Radionuclides, (17 pages).

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   1
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
```

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 7
Summary of Pathway Selections 13
Contaminated Zone and Total Dose Summary 14
Total Dose Components
Time = 0.000E+00 15
Time = 1.000E+00 16
Time = 3.000E+00 17
Time = 1.000E+01 18
Time = 3.000E+01 19
Time = 1.000E+02 20
Time = 3.000E+02 21
Time = 1.000E+03 22
Dose/Source Ratios Summed Over All Pathways 23
Single Radionuclide Soil Guidelines 24
Dose Per Nuclide Summed Over All Pathways 25
Soil Concentration Per Nuclide 26

Attachment 1 Sheet No. 1 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 2
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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	Ac-225 (Source: FGR 12)	6.371E-02	6.371E-02	DCF1(1)
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(2)
A-1	Am-241 (Source: FGR 12)	4.372E-02	4.372E-02	DCF1(3)
A-1	At-217 (Source: FGR 12)	1.773E-03	1.773E-03	DCF1(4)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(5)
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(6)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(7)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(8)
A-1	Bi-213 (Source: FGR 12)	7.660E-01	7.660E-01	DCF1(9)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(10)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(11)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(12)
A-1	Eu-152 (Source: FGR 12)	7.006E+00	7.006E+00	DCF1(13)
A-1	Eu-154 (Source: FGR 12)	7.678E+00	7.678E+00	DCF1(14)
A-1	Eu-155 (Source: FGR 12)	1.822E-01	1.822E-01	DCF1(15)
A-1	Fr-221 (Source: FGR 12)	1.536E-01	1.536E-01	DCF1(16)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(17)
A-1	Gd-152 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Np-237 (Source: FGR 12)	7.790E-02	7.790E-02	DCF1(19)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(20)
A-1	Pa-233 (Source: FGR 12)	1.020E+00	1.020E+00	DCF1(21)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(22)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(23)
A-1	Pb-209 (Source: FGR 12)	7.734E-04	7.734E-04	DCF1(24)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(25)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(26)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(27)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(28)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(29)
A-1	Po-213 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(30)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(31)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(32)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(33)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(34)
A-1	Ra-225 (Source: FGR 12)	1.102E-02	1.102E-02	DCF1(35)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(36)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(37)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(38)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(39)
A-1	Th-229 (Source: FGR 12)	3.213E-01	3.213E-01	DCF1(40)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(41)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(42)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(43)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(44)
A-1	Tl-209 (Source: FGR 12)	1.293E+01	1.293E+01	DCF1(45)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(46)
A-1	U-233 (Source: FGR 12)	1.397E-03	1.397E-03	DCF1(47)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(48)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(49)

Attachment	1	Sheet No.	2 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   3
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(50)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Eu-154	2.860E-04	2.860E-04	DCF2(7)
B-1	Eu-155	4.140E-05	4.140E-05	DCF2(8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(9)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(10)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(11)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(12)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(13)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(14)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(15)
B-1	U-233	1.350E-01	1.350E-01	DCF2(16)
B-1	U-234	1.320E-01	1.320E-01	DCF2(17)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(18)
B-1	U-238	1.180E-01	1.180E-01	DCF2(19)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(20)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Eu-154	9.550E-06	9.550E-06	DCF3(7)
D-1	Eu-155	1.530E-06	1.530E-06	DCF3(8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(9)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(10)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(11)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(12)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(13)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(14)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(15)
D-1	U-233	2.890E-04	2.890E-04	DCF3(16)
D-1	U-234	2.830E-04	2.830E-04	DCF3(17)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(18)
D-1	U-238	2.550E-04	2.550E-04	DCF3(19)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(20)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)

Attachment 1 Sheet No. 3 of 26
Originator: M. W. Perrot Date 3/7/2012
Chk'd By S.W. Clark Date 3/7/2012
Calc. No. (300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days        03/06/2012  06:50  Page   4
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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	Am-241	, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34					
D-34	Co-60	, plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34					
D-34	Cs-137+D	, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34					
D-34	Eu-152	, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(5,3)
D-34					
D-34	Eu-154	, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Eu-154	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Eu-154	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(7,3)
D-34					
D-34	Eu-155	, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	Eu-155	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(8,2)
D-34	Eu-155	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(8,3)
D-34					
D-34	Gd-152	, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	Gd-152	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,2)
D-34	Gd-152	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(9,3)
D-34					
D-34	Np-237+D	, plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(10,1)
D-34	Np-237+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(10,2)
D-34	Np-237+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(10,3)
D-34					
D-34	Pa-231	, plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(11,1)
D-34	Pa-231	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(11,2)
D-34	Pa-231	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)
D-34					
D-34	Pb-210+D	, plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(12,1)
D-34	Pb-210+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(12,2)
D-34	Pb-210+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(12,3)
D-34					
D-34	Ra-226+D	, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(13,1)
D-34	Ra-226+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,2)
D-34	Ra-226+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(13,3)
D-34					
D-34	Th-229+D	, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Th-229+D	, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Th-229+D	, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(14,3)
D-34					

Attachment	1	Sheet No.	4 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   5
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(15,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(16,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(16,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(16,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(17,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(17,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(17,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(18,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(18,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(18,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(19,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(19,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(19,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC(7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5				
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC(8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(8,2)
D-5				
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(9,2)
D-5				

Attachment	1	Sheet No.	5 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5     T« Limit = 180 days      03/06/2012  06:50  Page   6
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

                    Dose Conversion Factor (and Related) Parameter Summary (continued)
                                    Dose Library: FGR 12 & FGR 11
0     ³                                                        ³  Current  ³   Base    ³  Parameter
 Menu ³                        Parameter                       ³  Value#   ³   Case*   ³    Name
 ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 D-5  ³ Np-237+D  , fish                                       ³ 3.000E+01 ³ 3.000E+01 ³ BIOFAC( 10,1)
 D-5  ³ Np-237+D  , crustacea and mollusks                     ³ 4.000E+02 ³ 4.000E+02 ³ BIOFAC( 10,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ Pa-231    , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 11,1)
 D-5  ³ Pa-231    , crustacea and mollusks                     ³ 1.100E+02 ³ 1.100E+02 ³ BIOFAC( 11,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ Pb-210+D  , fish                                       ³ 3.000E+02 ³ 3.000E+02 ³ BIOFAC( 12,1)
 D-5  ³ Pb-210+D  , crustacea and mollusks                     ³ 1.000E+02 ³ 1.000E+02 ³ BIOFAC( 12,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ Ra-226+D  , fish                                       ³ 5.000E+01 ³ 5.000E+01 ³ BIOFAC( 13,1)
 D-5  ³ Ra-226+D  , crustacea and mollusks                     ³ 2.500E+02 ³ 2.500E+02 ³ BIOFAC( 13,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ Th-229+D  , fish                                       ³ 1.000E+02 ³ 1.000E+02 ³ BIOFAC( 14,1)
 D-5  ³ Th-229+D  , crustacea and mollusks                     ³ 5.000E+02 ³ 5.000E+02 ³ BIOFAC( 14,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ Th-230    , fish                                       ³ 1.000E+02 ³ 1.000E+02 ³ BIOFAC( 15,1)
 D-5  ³ Th-230    , crustacea and mollusks                     ³ 5.000E+02 ³ 5.000E+02 ³ BIOFAC( 15,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ U-233     , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 16,1)
 D-5  ³ U-233     , crustacea and mollusks                     ³ 6.000E+01 ³ 6.000E+01 ³ BIOFAC( 16,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ U-234     , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 17,1)
 D-5  ³ U-234     , crustacea and mollusks                     ³ 6.000E+01 ³ 6.000E+01 ³ BIOFAC( 17,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ U-235+D   , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 18,1)
 D-5  ³ U-235+D   , crustacea and mollusks                     ³ 6.000E+01 ³ 6.000E+01 ³ BIOFAC( 18,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ U-238     , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 19,1)
 D-5  ³ U-238     , crustacea and mollusks                     ³ 6.000E+01 ³ 6.000E+01 ³ BIOFAC( 19,2)
 D-5  ³                                                        ³           ³           ³
 D-5  ³ U-238+D   , fish                                       ³ 1.000E+01 ³ 1.000E+01 ³ BIOFAC( 20,1)
 D-5  ³ U-238+D   , crustacea and mollusks                     ³ 6.000E+01 ³ 6.000E+01 ³ BIOFAC( 20,2)
 ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
 #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. 6 of 26
Originator: M. W. Perrott	Date 3/7/2012
Chk'd By S. W. Clark	Date 3/7/2012
Calc. No. 0300X-CA-V0155	Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 7
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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)	3.000E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICKO
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	8.000E+00	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)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	3.720E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	2.300E-02	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	2.800E-02	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	7.900E-02	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Eu-154	8.100E-02	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.580E-01	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-234	1.210E+02	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): U-235	8.230E+00	0.000E+00	---	S1(18)
R012	Initial principal radionuclide (pCi/g): U-238	1.160E+02	0.000E+00	---	S1(19)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(17)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(18)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(19)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVERO
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	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)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.200E-03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	1.500E+01	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)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	0.000E+00	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	0.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.800E-02	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Attachment 1 Sheet No. 7 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

```
1RESRAD, Version 6.5      T½ Limit = 180 days        03/06/2012  06:50  Page   8
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	0.000E+00	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
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)	6.738E+05	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	5.000E-04	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	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)	1.270E+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	1.500E+01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.200E-03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+02	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+02	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.483E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.483E-04	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Attachment 1 Sheet No. 8 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   9
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
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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 Eu-152				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.913E-03	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.913E-03	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.913E-03	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.642E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Attachment	1	Sheet No.	9 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  10
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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 daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.121E-05	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.792E-05	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.483E-04	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.746E-04	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.491E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	2.000E+02	6.000E+04	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.739E-05	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)

Attachment	1	Sheet No.	10 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 11
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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 daughter U-233				
R016	Contaminated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	8.900E+00	5.000E+01	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.913E-03	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
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)
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

Attachment 1 Sheet No. 11 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 12
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	0.150E-01	FPLANT
R018	Contamination fraction of meat	-1	-1	0.150E-02	FMEAT
R018	Contamination fraction of milk	-1	-1	0.150E-02	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)
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)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5

Attachment 1 Sheet No. 12 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  13
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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
TITL	Maximum number of integration points for dose	5	---	---	LYMAX
TITL	Maximum number of integration points for risk	9	---	---	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.	13 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  14
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

     Contaminated Zone Dimensions          Initial Soil Concentrations, pCi/g
     ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ          ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
       Area:     30.00 square meters              Am-241     3.720E-01
  Thickness:      1.00 meters                     Co-60      2.300E-02
Cover Depth:      0.00 meters                     Cs-137     2.800E-02
                                                  Eu-152     7.900E-02
                                                  Eu-154     8.100E-02
                                                  Eu-155     1.580E-01
                                                  U-234      1.210E+02
                                                  U-235      8.230E+00
                                                  U-238      1.160E+02
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)
             ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
   t (years):  0.000E+00  1.000E+00  3.000E+00  1.000E+01  3.000E+01  1.000E+02  3.000E+02  1.000E+03
    TDOSE(t):  1.241E+01  1.234E+01  1.220E+01  1.182E+01  1.116E+01  9.707E+00  6.734E+00  2.345E+00
        M(t):  8.274E-01  8.224E-01  8.133E-01  7.883E-01  7.440E-01  6.471E-01  4.489E-01  1.564E-01
0Maximum TDOSE(t):  1.241E+01 mrem/yr   at t = 0.000E+00 years
```

Attachment	1	Sheet No.	14 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  15
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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 = 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.
Am-241	7.616E-03	0.0006	3.595E-03	0.0003	0.000E+00	0.0000	2.288E-03	0.0002	2.075E-06	0.0000	2.253E-07	0.0000	2.370E-03	0.0002
Co-60	1.514E-01	0.0122	1.028E-07	0.0000	0.000E+00	0.0000	7.839E-05	0.0000	3.719E-06	0.0000	8.521E-07	0.0000	1.016E-06	0.0000
Cs-137	4.105E-02	0.0033	1.923E-08	0.0000	0.000E+00	0.0000	9.357E-05	0.0000	7.219E-06	0.0000	4.484E-06	0.0000	2.424E-06	0.0000
Eu-152	2.354E-01	0.0190	3.706E-07	0.0000	0.000E+00	0.0000	2.108E-06	0.0000	3.610E-08	0.0000	2.385E-09	0.0000	8.739E-07	0.0000
Eu-154	2.597E-01	0.0209	4.852E-07	0.0000	0.000E+00	0.0000	3.144E-06	0.0000	5.384E-08	0.0000	3.557E-09	0.0000	1.303E-06	0.0000
Eu-155	1.251E-02	0.0010	1.330E-07	0.0000	0.000E+00	0.0000	9.536E-07	0.0000	1.633E-08	0.0000	1.079E-09	0.0000	3.952E-07	0.0000
U-234	2.305E-02	0.0019	3.476E-01	0.0280	0.000E+00	0.0000	1.446E-01	0.0117	4.210E-04	0.0000	1.963E-03	0.0002	5.994E-02	0.0048
U-235	2.856E+00	0.2301	2.203E-02	0.0018	0.000E+00	0.0000	9.307E-03	0.0007	2.729E-05	0.0000	1.261E-04	0.0000	3.853E-03	0.0003
U-238	7.740E+00	0.6236	2.980E-01	0.0240	0.000E+00	0.0000	1.316E-01	0.0106	3.832E-04	0.0000	1.787E-03	0.0001	5.456E-02	0.0044
Total	1.133E+01	0.9126	6.711E-01	0.0541	0.000E+00	0.0000	2.880E-01	0.0232	8.446E-04	0.0001	3.882E-03	0.0003	1.207E-01	0.0097

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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.587E-02	0.0013
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	1.515E-01	0.0122
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	4.116E-02	0.0033
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	2.354E-01	0.0190
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.597E-01	0.0209
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.251E-02	0.0010
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.776E-01	0.0465
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.891E+00	0.2329
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.226E+00	0.6628
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	1.241E+01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	15 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days        03/06/2012  06:50  Page  16
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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.
Am-241	7.603E-03	0.0006	3.589E-03	0.0003	0.000E+00	0.0000	2.284E-03	0.0002	2.072E-06	0.0000	2.249E-07	0.0000	2.366E-03	0.0002
Co-60	1.327E-01	0.0108	9.009E-08	0.0000	0.000E+00	0.0000	6.871E-05	0.0000	3.259E-06	0.0000	7.469E-07	0.0000	8.901E-07	0.0000
Cs-137	4.010E-02	0.0033	1.878E-08	0.0000	0.000E+00	0.0000	9.140E-05	0.0000	7.051E-06	0.0000	4.380E-06	0.0000	2.368E-06	0.0000
Eu-152	2.234E-01	0.0181	3.517E-07	0.0000	0.000E+00	0.0000	2.001E-06	0.0000	3.427E-08	0.0000	2.264E-09	0.0000	8.296E-07	0.0000
Eu-154	2.400E-01	0.0195	4.484E-07	0.0000	0.000E+00	0.0000	2.906E-06	0.0000	4.975E-08	0.0000	3.287E-09	0.0000	1.204E-06	0.0000
Eu-155	1.088E-02	0.0009	1.156E-07	0.0000	0.000E+00	0.0000	8.292E-07	0.0000	1.420E-08	0.0000	9.380E-10	0.0000	3.437E-07	0.0000
U-234	2.301E-02	0.0019	3.469E-01	0.0281	0.000E+00	0.0000	1.443E-01	0.0117	4.202E-04	0.0000	1.959E-03	0.0002	5.982E-02	0.0048
U-235	2.850E+00	0.2311	2.199E-02	0.0018	0.000E+00	0.0000	9.321E-03	0.0008	2.782E-05	0.0000	1.259E-04	0.0000	3.849E-03	0.0003
U-238	7.725E+00	0.6262	2.974E-01	0.0241	0.000E+00	0.0000	1.314E-01	0.0107	3.825E-04	0.0000	1.784E-03	0.0001	5.445E-02	0.0044
Total	1.125E+01	0.9122	6.699E-01	0.0543	0.000E+00	0.0000	2.875E-01	0.0233	8.429E-04	0.0001	3.874E-03	0.0003	1.205E-01	0.0098

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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.584E-02	0.0013
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	1.328E-01	0.0108
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	4.020E-02	0.0033
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	2.234E-01	0.0181
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.401E-01	0.0195
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.088E-02	0.0009
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.765E-01	0.0467
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.885E+00	0.2339
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.211E+00	0.6656
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	1.234E+01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	16 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  17
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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
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.
Am-241	7.577E-03	0.0006	3.576E-03	0.0003	0.000E+00	0.0000	2.277E-03	0.0002	2.065E-06	0.0000	2.242E-07	0.0000	2.358E-03	0.0002
Co-60	1.019E-01	0.0084	6.921E-08	0.0000	0.000E+00	0.0000	5.278E-05	0.0000	2.504E-06	0.0000	5.737E-07	0.0000	6.838E-07	0.0000
Cs-137	3.826E-02	0.0031	1.792E-08	0.0000	0.000E+00	0.0000	8.721E-05	0.0000	6.728E-06	0.0000	4.179E-06	0.0000	2.260E-06	0.0000
Eu-152	2.013E-01	0.0165	3.169E-07	0.0000	0.000E+00	0.0000	1.803E-06	0.0000	3.088E-08	0.0000	2.040E-09	0.0000	7.475E-07	0.0000
Eu-154	2.050E-01	0.0168	3.830E-07	0.0000	0.000E+00	0.0000	2.482E-06	0.0000	4.249E-08	0.0000	2.808E-09	0.0000	1.029E-06	0.0000
Eu-155	8.222E-03	0.0007	8.741E-08	0.0000	0.000E+00	0.0000	6.269E-07	0.0000	1.073E-08	0.0000	7.092E-10	0.0000	2.598E-07	0.0000
U-234	2.293E-02	0.0019	3.456E-01	0.0283	0.000E+00	0.0000	1.438E-01	0.0118	4.186E-04	0.0000	1.952E-03	0.0002	5.960E-02	0.0049
U-235	2.839E+00	0.2328	2.192E-02	0.0018	0.000E+00	0.0000	9.349E-03	0.0008	2.889E-05	0.0000	1.254E-04	0.0000	3.841E-03	0.0003
U-238	7.696E+00	0.6309	2.963E-01	0.0243	0.000E+00	0.0000	1.309E-01	0.0107	3.810E-04	0.0000	1.777E-03	0.0001	5.425E-02	0.0044
Total	1.112E+01	0.9116	6.674E-01	0.0547	0.000E+00	0.0000	2.864E-01	0.0235	8.399E-04	0.0001	3.859E-03	0.0003	1.200E-01	0.0098

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
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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.579E-02	0.0013
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	1.020E-01	0.0084
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	3.836E-02	0.0031
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	2.013E-01	0.0165
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.050E-01	0.0168
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.223E-03	0.0007
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.743E-01	0.0471
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.875E+00	0.2356
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.179E+00	0.6705
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	1.220E+01	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	17 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  18
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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+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.
Am-241	7.489E-03	0.0006	3.534E-03	0.0003	0.000E+00	0.0000	2.250E-03	0.0002	2.041E-06	0.0000	2.215E-07	0.0000	2.331E-03	0.0002
Co-60	4.051E-02	0.0034	2.750E-08	0.0000	0.000E+00	0.0000	2.097E-05	0.0000	9.949E-07	0.0000	2.280E-07	0.0000	2.717E-07	0.0000
Cs-137	3.247E-02	0.0027	1.521E-08	0.0000	0.000E+00	0.0000	7.401E-05	0.0000	5.710E-06	0.0000	3.546E-06	0.0000	1.917E-06	0.0000
Eu-152	1.398E-01	0.0118	2.201E-07	0.0000	0.000E+00	0.0000	1.252E-06	0.0000	2.144E-08	0.0000	1.417E-09	0.0000	5.191E-07	0.0000
Eu-154	1.181E-01	0.0100	2.205E-07	0.0000	0.000E+00	0.0000	1.429E-06	0.0000	2.447E-08	0.0000	1.617E-09	0.0000	5.923E-07	0.0000
Eu-155	3.090E-03	0.0003	3.284E-08	0.0000	0.000E+00	0.0000	2.355E-07	0.0000	4.033E-09	0.0000	2.665E-10	0.0000	9.763E-08	0.0000
U-234	2.274E-02	0.0019	3.411E-01	0.0288	0.000E+00	0.0000	1.419E-01	0.0120	4.130E-04	0.0000	1.926E-03	0.0002	5.881E-02	0.0050
U-235	2.802E+00	0.2370	2.170E-02	0.0018	0.000E+00	0.0000	9.456E-03	0.0008	3.260E-05	0.0000	1.238E-04	0.0000	3.819E-03	0.0003
U-238	7.593E+00	0.6422	2.923E-01	0.0247	0.000E+00	0.0000	1.291E-01	0.0109	3.760E-04	0.0000	1.753E-03	0.0001	5.353E-02	0.0045
Total	1.076E+01	0.9100	6.586E-01	0.0557	0.000E+00	0.0000	2.828E-01	0.0239	8.304E-04	0.0001	3.807E-03	0.0003	1.185E-01	0.0100

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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.561E-02	0.0013
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	4.053E-02	0.0034
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	3.255E-02	0.0028
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	1.398E-01	0.0118
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.181E-01	0.0100
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.090E-03	0.0003
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.668E-01	0.0479
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.837E+00	0.2399
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.070E+00	0.6825
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	1.182E+01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	18 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 19
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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 = 3.000E+01 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.
Am-241	7.241E-03	0.0006	3.417E-03	0.0003	0.000E+00	0.0000	2.175E-03	0.0002	1.974E-06	0.0000	2.142E-07	0.0000	2.253E-03	0.0002
Co-60	2.899E-03	0.0003	1.968E-09	0.0000	0.000E+00	0.0000	1.501E-06	0.0000	7.121E-08	0.0000	1.632E-08	0.0000	1.945E-08	0.0000
Cs-137	2.031E-02	0.0018	9.515E-09	0.0000	0.000E+00	0.0000	4.630E-05	0.0000	3.572E-06	0.0000	2.218E-06	0.0000	1.200E-06	0.0000
Eu-152	4.933E-02	0.0044	7.766E-08	0.0000	0.000E+00	0.0000	4.419E-07	0.0000	7.567E-09	0.0000	5.000E-10	0.0000	1.832E-07	0.0000
Eu-154	2.439E-02	0.0022	4.556E-08	0.0000	0.000E+00	0.0000	2.952E-07	0.0000	5.055E-09	0.0000	3.340E-10	0.0000	1.224E-07	0.0000
Eu-155	1.885E-04	0.0000	2.004E-09	0.0000	0.000E+00	0.0000	1.437E-08	0.0000	2.461E-10	0.0000	1.626E-11	0.0000	5.956E-09	0.0000
U-234	2.282E-02	0.0020	3.284E-01	0.0294	0.000E+00	0.0000	1.366E-01	0.0122	3.976E-04	0.0000	1.854E-03	0.0002	5.662E-02	0.0051
U-235	2.698E+00	0.2418	2.121E-02	0.0019	0.000E+00	0.0000	9.810E-03	0.0009	4.287E-05	0.0000	1.192E-04	0.0000	3.780E-03	0.0003
U-238	7.308E+00	0.6549	2.814E-01	0.0252	0.000E+00	0.0000	1.243E-01	0.0111	3.619E-04	0.0000	1.688E-03	0.0002	5.152E-02	0.0046
Total	1.013E+01	0.9081	6.344E-01	0.0568	0.000E+00	0.0000	2.729E-01	0.0245	8.080E-04	0.0001	3.663E-03	0.0003	1.142E-01	0.0102

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+01 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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.509E-02	0.0014
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	2.901E-03	0.0003
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	2.037E-02	0.0018
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	4.933E-02	0.0044
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.439E-02	0.0022
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.885E-04	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.467E-01	0.0490
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.733E+00	0.2449
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.768E+00	0.6960
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	1.116E+01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	19 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  20
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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+02 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.
Am-241	6.436E-03	0.0007	3.035E-03	0.0003	0.000E+00	0.0000	1.934E-03	0.0002	1.757E-06	0.0000	1.903E-07	0.0000	2.002E-03	0.0002
Co-60	2.844E-07	0.0000	1.931E-13	0.0000	0.000E+00	0.0000	1.473E-10	0.0000	6.986E-12	0.0000	1.601E-12	0.0000	1.908E-12	0.0000
Cs-137	3.933E-03	0.0004	1.842E-09	0.0000	0.000E+00	0.0000	8.965E-06	0.0000	6.917E-07	0.0000	4.296E-07	0.0000	2.323E-07	0.0000
Eu-152	1.287E-03	0.0001	2.027E-09	0.0000	0.000E+00	0.0000	1.153E-08	0.0000	1.974E-10	0.0000	1.305E-11	0.0000	4.780E-09	0.0000
Eu-154	9.771E-05	0.0000	1.825E-10	0.0000	0.000E+00	0.0000	1.183E-09	0.0000	2.025E-11	0.0000	1.338E-12	0.0000	4.903E-10	0.0000
Eu-155	1.057E-08	0.0000	1.124E-13	0.0000	0.000E+00	0.0000	8.062E-13	0.0000	1.380E-14	0.0000	9.120E-16	0.0000	3.341E-13	0.0000
U-234	2.967E-02	0.0031	2.877E-01	0.0296	0.000E+00	0.0000	1.198E-01	0.0123	3.487E-04	0.0000	1.623E-03	0.0002	4.960E-02	0.0051
U-235	2.370E+00	0.2441	2.024E-02	0.0021	0.000E+00	0.0000	1.116E-02	0.0012	7.530E-05	0.0000	1.046E-04	0.0000	3.756E-03	0.0004
U-238	6.393E+00	0.6586	2.462E-01	0.0254	0.000E+00	0.0000	1.088E-01	0.0112	3.166E-04	0.0000	1.476E-03	0.0002	4.507E-02	0.0046
Total	8.804E+00	0.9070	5.571E-01	0.0574	0.000E+00	0.0000	2.417E-01	0.0249	7.431E-04	0.0001	3.204E-03	0.0003	1.004E-01	0.0103

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

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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.341E-02	0.0014
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	2.846E-07	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	3.944E-03	0.0004
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	1.287E-03	0.0001
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.772E-05	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.058E-08	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.888E-01	0.0504
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.405E+00	0.2478
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.794E+00	0.6999
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	9.707E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	20 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 21
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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 = 3.000E+02 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.
Am-241	4.599E-03	0.0007	2.165E-03	0.0003	0.000E+00	0.0000	1.382E-03	0.0002	1.262E-06	0.0000	1.358E-07	0.0000	1.427E-03	0.0002
Co-60	1.004E-18	0.0000	6.814E-25	0.0000	0.000E+00	0.0000	5.197E-22	0.0000	2.465E-23	0.0000	5.649E-24	0.0000	6.732E-24	0.0000
Cs-137	3.611E-05	0.0000	1.692E-11	0.0000	0.000E+00	0.0000	8.231E-08	0.0000	6.350E-09	0.0000	3.944E-09	0.0000	2.133E-09	0.0000
Eu-152	3.850E-08	0.0000	6.063E-14	0.0000	0.000E+00	0.0000	3.449E-13	0.0000	5.906E-15	0.0000	3.902E-16	0.0000	1.430E-13	0.0000
Eu-154	1.383E-11	0.0000	2.583E-17	0.0000	0.000E+00	0.0000	1.674E-16	0.0000	2.866E-18	0.0000	1.894E-19	0.0000	6.938E-17	0.0000
Eu-155	7.557E-21	0.0000	8.033E-26	0.0000	0.000E+00	0.0000	5.761E-25	0.0000	9.865E-27	0.0000	6.518E-28	0.0000	2.388E-25	0.0000
U-234	9.262E-02	0.0138	1.974E-01	0.0293	0.000E+00	0.0000	8.476E-02	0.0126	2.462E-04	0.0000	1.119E-03	0.0002	3.418E-02	0.0051
U-235	1.643E+00	0.2439	1.840E-02	0.0027	0.000E+00	0.0000	1.407E-02	0.0021	1.424E-04	0.0000	7.234E-05	0.0000	3.741E-03	0.0006
U-238	4.361E+00	0.6476	1.680E-01	0.0250	0.000E+00	0.0000	7.423E-02	0.0110	2.161E-04	0.0000	1.008E-03	0.0001	3.077E-02	0.0046
Total	6.101E+00	0.9059	3.860E-01	0.0573	0.000E+00	0.0000	1.744E-01	0.0259	6.060E-04	0.0001	2.199E-03	0.0003	7.012E-02	0.0104

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 = 3.000E+02 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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.574E-03	0.0014
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	1.004E-18	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	3.621E-05	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	3.850E-08	0.0000
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.383E-11	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.558E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.103E-01	0.0609
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.679E+00	0.2493
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.635E+00	0.6883
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	6.734E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	21 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  22
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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+03 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.
Am-241	1.431E-03	0.0006	6.632E-04	0.0003	0.000E+00	0.0000	4.301E-04	0.0002	4.074E-07	0.0000	4.182E-08	0.0000	4.373E-04	0.0002
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	2.678E-12	0.0000	1.254E-18	0.0000	0.000E+00	0.0000	6.103E-15	0.0000	4.708E-16	0.0000	2.924E-16	0.0000	1.581E-16	0.0000
Eu-152	5.635E-24	0.0000	1.409E-17	0.0000	0.000E+00	0.0000	1.811E-18	0.0000	3.102E-20	0.0000	8.197E-22	0.0000	7.508E-19	0.0000
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	5.039E-01	0.2148	5.449E-02	0.0232	0.000E+00	0.0000	4.306E-02	0.0184	1.233E-04	0.0001	3.784E-04	0.0002	1.076E-02	0.0046
U-235	4.809E-01	0.2050	1.369E-02	0.0058	0.000E+00	0.0000	1.610E-02	0.0069	2.123E-04	0.0001	2.083E-05	0.0000	3.252E-03	0.0014
U-238	1.144E+00	0.4876	4.415E-02	0.0188	0.000E+00	0.0000	1.952E-02	0.0083	5.681E-05	0.0000	2.648E-04	0.0001	8.084E-03	0.0034
Total	2.130E+00	0.9080	1.130E-01	0.0482	0.000E+00	0.0000	7.911E-02	0.0337	3.928E-04	0.0002	6.641E-04	0.0003	2.253E-02	0.0096

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
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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.962E-03	0.0013
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	2.685E-12	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	1.668E-17	0.0000
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.127E-01	0.2612
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.141E-01	0.2192
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.216E+00	0.5183
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	2.345E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	22 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 23
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	4.266E-02	4.259E-02	4.245E-02	4.195E-02	4.055E-02	3.603E-02	2.569E-02	7.863E-03
Am-241	Np-237+D	1.000E+00	1.060E-07	3.208E-07	7.495E-07	2.238E-06	6.392E-06	1.983E-05	5.016E-05	9.948E-05
Am-241	U-233	1.000E+00	1.470E-15	9.463E-15	4.795E-14	4.160E-13	3.397E-12	3.378E-11	2.378E-10	1.214E-09
Am-241	Th-229+D	1.000E+00	4.327E-18	6.472E-17	7.531E-16	1.983E-14	4.758E-13	1.592E-11	3.529E-10	7.069E-09
Am-241	äDSR(j)		4.266E-02	4.259E-02	4.245E-02	4.195E-02	4.056E-02	3.605E-02	2.574E-02	7.963E-03
0Co-60	Co-60	1.000E+00	6.587E+00	5.773E+00	4.435E+00	1.762E+00	1.261E-01	1.237E-05	4.366E-17	0.000E+00
0Cs-137+D	Cs-137+D	1.000E+00	1.470E+00	1.436E+00	1.370E+00	1.163E+00	7.273E-01	1.408E-01	1.293E-03	9.588E-11
0Eu-152	Eu-152	7.208E-01	2.147E+00	2.039E+00	1.837E+00	1.276E+00	4.501E-01	1.174E-02	3.513E-07	5.141E-23
0Eu-152	Eu-152	2.792E-01	8.318E-01	7.896E-01	7.115E-01	4.941E-01	1.743E-01	4.549E-03	1.361E-07	1.992E-23
Eu-152	Gd-152	2.792E-01	5.519E-18	1.618E-17	3.591E-17	9.081E-17	1.715E-16	2.141E-16	2.143E-16	2.112E-16
Eu-152	äDSR(j)		8.318E-01	7.896E-01	7.115E-01	4.941E-01	1.743E-01	4.549E-03	1.361E-07	2.112E-16
0Eu-154	Eu-154	1.000E+00	3.207E+00	2.964E+00	2.531E+00	1.458E+00	3.011E-01	1.206E-03	1.707E-10	1.820E-34
0Eu-155	Eu-155	1.000E+00	7.917E-02	6.884E-02	5.205E-02	1.956E-02	1.193E-03	6.693E-08	4.783E-20	0.000E+00
0U-234	U-234	1.000E+00	4.773E-03	4.764E-03	4.746E-03	4.683E-03	4.507E-03	3.941E-03	2.687E-03	7.030E-04
U-234	Th-230	1.000E+00	4.339E-08	1.292E-07	3.003E-07	8.938E-07	2.544E-06	7.821E-06	1.934E-05	3.597E-05
U-234	Ra-226+D	1.000E+00	3.207E-09	2.246E-08	1.185E-07	1.054E-06	8.732E-06	8.909E-05	6.693E-04	4.211E-03
U-234	Pb-210+D	1.000E+00	9.481E-13	1.231E-11	1.301E-10	3.094E-09	6.358E-08	1.423E-06	1.563E-05	1.140E-04
U-234	äDSR(j)		4.773E-03	4.764E-03	4.746E-03	4.685E-03	4.518E-03	4.039E-03	3.391E-03	5.064E-03
0U-235+D	U-235+D	1.000E+00	3.513E-01	3.506E-01	3.493E-01	3.446E-01	3.317E-01	2.901E-01	1.979E-01	5.188E-02
U-235+D	Pa-231	1.000E+00	3.219E-06	9.848E-06	2.308E-05	6.891E-05	1.959E-04	5.967E-04	1.432E-03	2.343E-03
U-235+D	Ac-227+D	1.000E+00	1.291E-07	8.858E-07	4.559E-06	3.761E-05	2.565E-04	1.522E-03	4.675E-03	8.246E-03
U-235+D	äDSR(j)		3.513E-01	3.506E-01	3.493E-01	3.447E-01	3.321E-01	2.922E-01	2.040E-01	6.247E-02
0U-238	U-238	5.400E-05	2.248E-07	2.244E-07	2.235E-07	2.205E-07	2.123E-07	1.857E-07	1.266E-07	3.320E-08
0U-238+D	U-238+D	9.999E-01	7.092E-02	7.078E-02	7.051E-02	6.957E-02	6.696E-02	5.857E-02	3.995E-02	1.047E-02
U-238+D	U-234	9.999E-01	6.763E-09	2.026E-08	4.708E-08	1.394E-07	3.897E-07	1.123E-06	2.290E-06	1.997E-06
U-238+D	Th-230	9.999E-01	4.123E-14	2.857E-13	1.501E-12	1.328E-11	1.090E-10	1.080E-09	7.491E-09	3.635E-08
U-238+D	Ra-226+D	9.999E-01	2.271E-15	3.407E-14	3.969E-13	1.045E-11	2.498E-10	8.247E-09	1.760E-07	3.072E-06
U-238+D	Pb-210+D	9.999E-01	5.664E-19	1.502E-17	3.384E-16	2.360E-14	1.429E-12	1.108E-10	3.778E-09	8.123E-08
U-238+D	äDSR(j)		7.092E-02	7.078E-02	7.051E-02	6.957E-02	6.696E-02	5.857E-02	3.996E-02	1.048E-02

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Attachment 1 Sheet No. 23 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 24
Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

ONuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Am-241	3.516E+02	3.522E+02	3.534E+02	3.576E+02	3.698E+02	4.161E+02	5.828E+02	1.884E+03
Co-60	2.277E+00	2.598E+00	3.382E+00	8.512E+00	1.189E+02	1.212E+06	*1.132E+15	*1.132E+15
Cs-137	1.020E+01	1.045E+01	1.095E+01	1.290E+01	2.062E+01	1.065E+02	1.160E+04	1.565E+11
Eu-152	5.035E+00	5.304E+00	5.886E+00	8.476E+00	2.402E+01	9.206E+02	3.078E+07	*1.765E+14
Eu-154	4.678E+00	5.061E+00	5.926E+00	1.029E+01	4.982E+01	1.243E+04	8.786E+10	*2.639E+14
Eu-155	1.895E+02	2.179E+02	2.882E+02	7.670E+02	1.257E+04	2.241E+08	*4.652E+14	*4.652E+14
U-234	3.143E+03	3.149E+03	3.160E+03	3.202E+03	3.320E+03	3.713E+03	4.423E+03	2.962E+03
U-235	4.270E+01	4.278E+01	4.294E+01	4.351E+01	4.516E+01	5.133E+01	7.353E+01	2.401E+02
U-238	2.115E+02	2.119E+02	2.127E+02	2.156E+02	2.240E+02	2.561E+02	3.754E+02	1.431E+03
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

*At specific activity limit

0

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 = 0.000E+00 years

ONuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Am-241	3.720E-01	0.000E+00	4.266E-02	3.516E+02	4.266E-02	3.516E+02
Co-60	2.300E-02	0.000E+00	6.587E+00	2.277E+00	6.587E+00	2.277E+00
Cs-137	2.800E-02	0.000E+00	1.470E+00	1.020E+01	1.470E+00	1.020E+01
Eu-152	7.900E-02	0.000E+00	2.979E+00	5.035E+00	2.979E+00	5.035E+00
Eu-154	8.100E-02	0.000E+00	3.207E+00	4.678E+00	3.207E+00	4.678E+00
Eu-155	1.580E-01	0.000E+00	7.917E-02	1.895E+02	7.917E-02	1.895E+02
U-234	1.210E+02	1.000E+03	5.064E-03	2.962E+03	4.773E-03	3.143E+03
U-235	8.230E+00	0.000E+00	3.513E-01	4.270E+01	3.513E-01	4.270E+01
U-238	1.160E+02	0.000E+00	7.092E-02	2.115E+02	7.092E-02	2.115E+02
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

Attachment 1 Sheet No. 24 of 26
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page  25
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Am-241	Am-241	1.000E+00	1.587E-02	1.584E-02	1.579E-02	1.560E-02	1.509E-02	1.340E-02	9.556E-03	2.925E-03
ONp-237	Am-241	1.000E+00	3.943E-08	1.193E-07	2.788E-07	8.326E-07	2.378E-06	7.376E-06	1.866E-05	3.701E-05
OU-233	Am-241	1.000E+00	5.470E-16	3.520E-15	1.784E-14	1.547E-13	1.264E-12	1.257E-11	8.848E-11	4.515E-10
OTh-229	Am-241	1.000E+00	1.610E-18	2.408E-17	2.802E-16	7.378E-15	1.770E-13	5.922E-12	1.313E-10	2.630E-09
OCo-60	Co-60	1.000E+00	1.515E-01	1.328E-01	1.020E-01	4.053E-02	2.901E-03	2.846E-07	1.004E-18	0.000E+00
OCs-137	Cs-137	1.000E+00	4.116E-02	4.020E-02	3.836E-02	3.255E-02	2.037E-02	3.944E-03	3.621E-05	2.685E-12
OEu-152	Eu-152	7.208E-01	1.697E-01	1.610E-01	1.451E-01	1.008E-01	3.556E-02	9.278E-04	2.775E-08	4.062E-24
Eu-152	Eu-152	2.792E-01	6.571E-02	6.238E-02	5.621E-02	3.903E-02	1.377E-02	3.594E-04	1.075E-08	1.573E-24
Eu-152	äDOSE(j)		2.354E-01	2.234E-01	2.013E-01	1.398E-01	4.933E-02	1.287E-03	3.850E-08	5.635E-24
OGd-152	Eu-152	2.792E-01	4.360E-19	1.278E-18	2.837E-18	7.174E-18	1.355E-17	1.691E-17	1.693E-17	1.668E-17
OEu-154	Eu-154	1.000E+00	2.597E-01	2.401E-01	2.050E-01	1.181E-01	2.439E-02	9.772E-05	1.383E-11	0.000E+00
OEu-155	Eu-155	1.000E+00	1.251E-02	1.088E-02	8.223E-03	3.090E-03	1.885E-04	1.058E-08	7.558E-21	0.000E+00
OU-234	U-234	1.000E+00	5.775E-01	5.764E-01	5.742E-01	5.666E-01	5.453E-01	4.769E-01	3.251E-01	8.506E-02
U-234	U-238	9.999E-01	7.845E-07	2.350E-06	5.462E-06	1.617E-05	4.520E-05	1.303E-04	2.656E-04	2.316E-04
U-234	äDOSE(j)		5.775E-01	5.764E-01	5.742E-01	5.666E-01	5.453E-01	4.770E-01	3.254E-01	8.529E-02
OTh-230	U-234	1.000E+00	5.251E-06	1.564E-05	3.634E-05	1.081E-04	3.078E-04	9.464E-04	2.340E-03	4.352E-03
Th-230	U-238	9.999E-01	4.783E-12	3.315E-11	1.741E-10	1.540E-09	1.264E-08	1.253E-07	8.690E-07	4.217E-06
Th-230	äDOSE(j)		5.251E-06	1.564E-05	3.634E-05	1.081E-04	3.078E-04	9.465E-04	2.340E-03	4.356E-03
ORa-226	U-234	1.000E+00	3.881E-07	2.717E-06	1.434E-05	1.276E-04	1.057E-03	1.078E-02	8.099E-02	5.095E-01
Ra-226	U-238	9.999E-01	2.634E-13	3.953E-12	4.604E-11	1.212E-09	2.897E-08	9.566E-07	2.041E-05	3.563E-04
Ra-226	äDOSE(j)		3.881E-07	2.717E-06	1.434E-05	1.276E-04	1.057E-03	1.078E-02	8.101E-02	5.099E-01
OPb-210	U-234	1.000E+00	1.147E-10	1.490E-09	1.574E-08	3.744E-07	7.693E-06	1.722E-04	1.891E-03	1.379E-02
Pb-210	U-238	9.999E-01	6.570E-17	1.743E-15	3.925E-14	2.737E-12	1.658E-10	1.286E-08	4.383E-07	9.423E-06
Pb-210	äDOSE(j)		1.147E-10	1.490E-09	1.574E-08	3.744E-07	7.693E-06	1.722E-04	1.891E-03	1.380E-02
OU-235	U-235	1.000E+00	2.891E+00	2.885E+00	2.874E+00	2.836E+00	2.730E+00	2.388E+00	1.629E+00	4.270E-01
OPa-231	U-235	1.000E+00	2.650E-05	8.105E-05	1.899E-04	5.671E-04	1.612E-03	4.911E-03	1.178E-02	1.928E-02
OAc-227	U-235	1.000E+00	1.062E-06	7.290E-06	3.752E-05	3.095E-04	2.111E-03	1.253E-02	3.847E-02	6.787E-02
OU-238	U-238	5.400E-05	2.608E-05	2.603E-05	2.593E-05	2.558E-05	2.462E-05	2.154E-05	1.469E-05	3.851E-06
U-238	U-238	9.999E-01	8.226E+00	8.210E+00	8.179E+00	8.070E+00	7.767E+00	6.794E+00	4.635E+00	1.215E+00
U-238	äDOSE(j)		8.226E+00	8.211E+00	8.179E+00	8.070E+00	7.768E+00	6.794E+00	4.635E+00	1.215E+00
ßßßßßßß	ßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß	ßßßßßßßß

THF(i) is the thread fraction of the parent nuclide.

Attachment	1	Sheet No.	25 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 1

```
1RESRAD, Version 6.5      T« Limit = 180 days       03/06/2012  06:50  Page  26
 Summary : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
```

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	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Am-241	Am-241	1.000E+00	3.720E-01	3.714E-01	3.701E-01	3.658E-01	3.536E-01	3.141E-01	2.240E-01	6.856E-02
ONp-237	Am-241	1.000E+00	0.000E+00	1.204E-07	3.605E-07	1.194E-06	3.521E-06	1.105E-05	2.804E-05	5.566E-05
OU-233	Am-241	1.000E+00	0.000E+00	2.631E-13	2.362E-12	2.603E-11	2.286E-10	2.333E-09	1.655E-08	8.465E-08
OTh-229	Am-241	1.000E+00	0.000E+00	8.285E-18	2.233E-16	8.214E-15	2.175E-13	7.536E-12	1.687E-10	3.392E-09
OCo-60	Co-60	1.000E+00	2.300E-02	2.016E-02	1.549E-02	6.153E-03	4.404E-04	4.321E-08	1.525E-19	0.000E+00
OCs-137	Cs-137	1.000E+00	2.800E-02	2.735E-02	2.610E-02	2.215E-02	1.385E-02	2.683E-03	2.463E-05	1.826E-12
OEu-152	Eu-152	7.208E-01	5.694E-02	5.405E-02	4.871E-02	3.382E-02	1.193E-02	3.114E-04	9.315E-09	1.363E-24
Eu-152	Eu-152	2.792E-01	2.206E-02	2.094E-02	1.887E-02	1.310E-02	4.623E-03	1.206E-04	3.608E-09	5.281E-25
Eu-152	äS(j):		7.900E-02	7.499E-02	6.757E-02	4.693E-02	1.656E-02	4.321E-04	1.292E-08	1.891E-24
OGd-152	Eu-152	2.792E-01	0.000E+00	1.379E-16	3.932E-16	1.103E-15	2.147E-15	2.698E-15	2.702E-15	2.662E-15
OEu-154	Eu-154	1.000E+00	8.100E-02	7.486E-02	6.394E-02	3.682E-02	7.605E-03	3.047E-05	4.312E-12	4.598E-36
OEu-155	Eu-155	1.000E+00	1.580E-01	1.374E-01	1.039E-01	3.903E-02	2.381E-03	1.336E-07	9.546E-20	0.000E+00
OU-234	U-234	1.000E+00	1.210E+02	1.208E+02	1.203E+02	1.187E+02	1.142E+02	9.991E+01	6.811E+01	1.782E+01
U-234	U-238	9.999E-01	0.000E+00	3.282E-04	9.809E-04	3.226E-03	9.315E-03	2.716E-02	5.556E-02	4.850E-02
U-234	äS(j):		1.210E+02	1.208E+02	1.203E+02	1.187E+02	1.143E+02	9.994E+01	6.817E+01	1.787E+01
OTh-230	U-234	1.000E+00	0.000E+00	1.088E-03	3.258E-03	1.078E-02	3.171E-02	9.864E-02	2.447E-01	4.556E-01
Th-230	U-238	9.999E-01	0.000E+00	1.478E-09	1.327E-08	1.461E-07	1.281E-06	1.300E-05	9.073E-05	4.413E-04
Th-230	äS(j):		0.000E+00	1.088E-03	3.258E-03	1.078E-02	3.171E-02	9.865E-02	2.447E-01	4.560E-01
ORa-226	U-234	1.000E+00	0.000E+00	2.357E-07	2.118E-06	2.338E-05	2.067E-04	2.158E-03	1.632E-02	1.029E-01
Ra-226	U-238	9.999E-01	0.000E+00	2.135E-13	5.751E-12	2.113E-10	5.575E-09	1.906E-07	4.108E-06	7.196E-05
Ra-226	äS(j):		0.000E+00	2.357E-07	2.118E-06	2.338E-05	2.067E-04	2.158E-03	1.633E-02	1.030E-01
OPb-210	U-234	1.000E+00	0.000E+00	2.424E-09	6.435E-08	2.249E-06	5.193E-05	1.210E-03	1.343E-02	9.827E-02
Pb-210	U-238	9.999E-01	0.000E+00	1.649E-15	1.317E-13	1.548E-11	1.096E-09	8.981E-08	3.107E-06	6.712E-05
Pb-210	äS(j):		0.000E+00	2.424E-09	6.435E-08	2.249E-06	5.193E-05	1.210E-03	1.343E-02	9.834E-02
OU-235	U-235	1.000E+00	8.230E+00	8.214E+00	8.183E+00	8.074E+00	7.771E+00	6.797E+00	4.637E+00	1.216E+00
OPa-231	U-235	1.000E+00	0.000E+00	1.739E-04	5.206E-04	1.722E-03	5.049E-03	1.555E-02	3.743E-02	6.132E-02
OAc-227	U-235	1.000E+00	0.000E+00	2.740E-06	2.409E-05	2.473E-04	1.801E-03	1.092E-02	3.372E-02	5.956E-02
OU-238	U-238	5.400E-05	6.264E-03	6.252E-03	6.228E-03	6.145E-03	5.915E-03	5.174E-03	3.529E-03	9.252E-04
U-238	U-238	9.999E-01	1.160E+02	1.158E+02	1.153E+02	1.138E+02	1.095E+02	9.580E+01	6.535E+01	1.713E+01
U-238	äS(j):		1.160E+02	1.158E+02	1.153E+02	1.138E+02	1.095E+02	9.581E+01	6.535E+01	1.713E+01
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

THF(i) is the thread fraction of the parent nuclide.
ORESCALC.EXE execution time = 7.33 seconds

Attachment	1	Sheet No.	26 of 26
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

```
1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   1
 Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

                    Table of Contents
                    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
          Part IV: Concentration of Radionuclides
          ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ

 Concentration of radionuclides in different media
      Time= 0.000E+00 ..................................   2
      Time= 1.000E+00 ..................................   4
      Time= 3.000E+00 ..................................   6
      Time= 1.000E+01 ..................................   8
      Time= 3.000E+01 ..................................  10
      Time= 1.000E+02 ..................................  12
      Time= 3.000E+02 ..................................  14
      Time= 1.000E+03 ..................................  16
```

Attachment 2 Sheet No. 1 of 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   2
 Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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
Ac-227	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	3.720E-01	3.720E-01	2.523E-06	0.000E+00	0.000E+00
Co-60	2.300E-02	2.300E-02	1.560E-07	0.000E+00	0.000E+00
Cs-137	2.800E-02	2.800E-02	1.899E-07	0.000E+00	0.000E+00
Eu-152	7.900E-02	7.900E-02	5.357E-07	0.000E+00	0.000E+00
Eu-154	8.100E-02	8.100E-02	5.493E-07	0.000E+00	0.000E+00
Eu-155	1.580E-01	1.580E-01	1.071E-06	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	1.210E+02	1.210E+02	8.205E-04	0.000E+00	0.000E+00
U-235	8.230E+00	8.230E+00	5.581E-05	0.000E+00	0.000E+00
U-238	1.160E+02	1.160E+02	7.866E-04	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.

Attachment	2	Sheet No. 2 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        03/06/2012  06:50  Page   3
 Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD
```

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
Ac-227	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
Am-241	0.000E+00	3.721E-01	3.727E-01	3.727E-01	3.727E-01	1.057E-02	4.130E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	1.840E+00	1.840E+00	1.840E+00	1.840E+00	2.732E+00	2.254E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	1.120E+00	1.120E+00	1.120E+00	1.120E+00	2.705E+00	6.048E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.975E-01	1.976E-01	1.977E-01	1.977E-01	1.059E-01	2.519E-03	0.000E+00	0.000E+00
Eu-154	0.000E+00	2.025E-01	2.026E-01	2.027E-01	2.027E-01	1.086E-01	2.582E-03	0.000E+00	0.000E+00
Eu-155	0.000E+00	3.951E-01	3.953E-01	3.953E-01	3.953E-01	2.118E-01	5.037E-03	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
Np-237	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
Pa-231	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
Pb-210	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
Ra-226	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
Th-229	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
Th-230	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
U-233	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
U-234	0.000E+00	3.025E+02	3.027E+02	3.027E+02	3.027E+02	2.757E+01	4.629E+01	0.000E+00	0.000E+00
U-235	0.000E+00	2.058E+01	2.059E+01	2.059E+01	2.059E+01	1.875E+00	3.149E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.900E+02	2.902E+02	2.902E+02	2.902E+02	2.643E+01	4.438E+01	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 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 4
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	2.740E-06	2.740E-06	1.858E-11	0.000E+00	0.000E+00
Am-241	3.714E-01	3.714E-01	2.518E-06	0.000E+00	0.000E+00
Co-60	2.016E-02	2.016E-02	1.367E-07	0.000E+00	0.000E+00
Cs-137	2.735E-02	2.735E-02	1.855E-07	0.000E+00	0.000E+00
Eu-152	7.499E-02	7.499E-02	5.085E-07	0.000E+00	0.000E+00
Eu-154	7.486E-02	7.486E-02	5.076E-07	0.000E+00	0.000E+00
Eu-155	1.374E-01	1.374E-01	9.316E-07	0.000E+00	0.000E+00
Gd-152	1.379E-16	1.379E-16	9.354E-22	0.000E+00	0.000E+00
Np-237	1.204E-07	1.204E-07	8.164E-13	0.000E+00	0.000E+00
Pa-231	1.739E-04	1.739E-04	1.180E-09	0.000E+00	0.000E+00
Pb-210	2.424E-09	2.424E-09	1.644E-14	0.000E+00	0.000E+00
Ra-226	2.357E-07	2.357E-07	1.599E-12	0.000E+00	0.000E+00
Th-229	8.285E-18	8.285E-18	5.619E-23	0.000E+00	0.000E+00
Th-230	1.088E-03	1.088E-03	7.379E-09	0.000E+00	0.000E+00
U-233	2.631E-13	2.631E-13	1.784E-18	0.000E+00	0.000E+00
U-234	1.208E+02	1.208E+02	8.190E-04	0.000E+00	0.000E+00
U-235	8.214E+00	8.214E+00	5.570E-05	0.000E+00	0.000E+00
U-238	1.158E+02	1.158E+02	7.851E-04	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.

Attachment	2	Sheet No. 4 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 5
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	8.382E-06	6.968E-06	1.033E-05	1.128E-05	1.635E-06	3.974E-08	0.000E+00	0.000E+00
Am-241	0.000E+00	3.715E-01	3.720E-01	3.721E-01	3.721E-01	1.055E-02	4.123E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	1.613E+00	1.613E+00	1.625E+00	1.613E+00	2.395E+00	1.976E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	1.094E+00	1.094E+00	1.096E+00	1.094E+00	2.642E+00	5.908E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.875E-01	1.876E-01	1.882E-01	1.877E-01	1.005E-01	2.391E-03	0.000E+00	0.000E+00
Eu-154	0.000E+00	1.872E-01	1.873E-01	1.881E-01	1.873E-01	1.003E-01	2.387E-03	0.000E+00	0.000E+00
Eu-155	0.000E+00	3.435E-01	3.437E-01	3.464E-01	3.439E-01	1.841E-01	4.380E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	3.449E-16	3.451E-16	3.267E-16	3.442E-16	1.849E-16	1.766E-18	0.000E+00	0.000E+00
Np-237	0.000E+00	2.320E-06	2.402E-06	1.995E-06	2.120E-06	1.927E-07	8.834E-10	0.000E+00	0.000E+00
Pa-231	0.000E+00	1.689E-03	1.736E-03	1.484E-03	1.574E-03	9.178E-04	1.049E-06	0.000E+00	0.000E+00
Pb-210	0.000E+00	3.195E-08	2.485E-08	3.790E-08	4.379E-08	3.800E-09	1.127E-09	0.000E+00	0.000E+00
Ra-226	0.000E+00	8.741E-06	9.380E-06	6.430E-06	7.264E-06	5.441E-07	5.168E-07	0.000E+00	0.000E+00
Th-229	0.000E+00	1.028E-17	8.407E-18	1.601E-17	1.801E-17	9.660E-19	5.981E-20	0.000E+00	0.000E+00
Th-230	0.000E+00	1.151E-03	1.095E-03	1.232E-03	1.288E-03	7.337E-05	4.206E-06	0.000E+00	0.000E+00
U-233	0.000E+00	9.972E-13	6.835E-13	1.516E-12	1.641E-12	1.211E-13	1.327E-13	0.000E+00	0.000E+00
U-234	0.000E+00	3.020E+02	3.021E+02	3.023E+02	3.022E+02	2.752E+01	4.620E+01	0.000E+00	0.000E+00
U-235	0.000E+00	2.054E+01	2.055E+01	2.056E+01	2.056E+01	1.872E+00	3.143E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.895E+02	2.897E+02	2.898E+02	2.897E+02	2.638E+01	4.430E+01	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 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 6
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	2.409E-05	2.409E-05	1.634E-10	0.000E+00	0.000E+00
Am-241	3.701E-01	3.701E-01	2.510E-06	0.000E+00	0.000E+00
Co-60	1.549E-02	1.549E-02	1.050E-07	0.000E+00	0.000E+00
Cs-137	2.610E-02	2.610E-02	1.770E-07	0.000E+00	0.000E+00
Eu-152	6.757E-02	6.757E-02	4.582E-07	0.000E+00	0.000E+00
Eu-154	6.394E-02	6.394E-02	4.336E-07	0.000E+00	0.000E+00
Eu-155	1.039E-01	1.039E-01	7.043E-07	0.000E+00	0.000E+00
Gd-152	3.932E-16	3.932E-16	2.666E-21	0.000E+00	0.000E+00
Np-237	3.605E-07	3.605E-07	2.445E-12	0.000E+00	0.000E+00
Pa-231	5.206E-04	5.206E-04	3.530E-09	0.000E+00	0.000E+00
Pb-210	6.435E-08	6.435E-08	4.364E-13	0.000E+00	0.000E+00
Ra-226	2.118E-06	2.118E-06	1.436E-11	0.000E+00	0.000E+00
Th-229	2.233E-16	2.233E-16	1.514E-21	0.000E+00	0.000E+00
Th-230	3.258E-03	3.258E-03	2.209E-08	0.000E+00	0.000E+00
U-233	2.362E-12	2.362E-12	1.602E-17	0.000E+00	0.000E+00
U-234	1.203E+02	1.203E+02	8.158E-04	0.000E+00	0.000E+00
U-235	8.183E+00	8.183E+00	5.549E-05	0.000E+00	0.000E+00
U-238	1.153E+02	1.153E+02	7.821E-04	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.

Attachment 2 Sheet No. 6 of 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 7
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	6.495E-05	6.062E-05	7.253E-05	7.483E-05	5.491E-06	3.230E-07	0.000E+00	0.000E+00
Am-241	0.000E+00	3.703E-01	3.708E-01	3.709E-01	3.708E-01	1.051E-02	4.109E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	1.239E+00	1.239E+00	1.248E+00	1.239E+00	1.840E+00	1.518E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	1.044E+00	1.044E+00	1.045E+00	1.044E+00	2.521E+00	5.638E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.690E-01	1.690E-01	1.695E-01	1.691E-01	9.056E-02	2.154E-03	0.000E+00	0.000E+00
Eu-154	0.000E+00	1.599E-01	1.600E-01	1.607E-01	1.600E-01	8.569E-02	2.038E-03	0.000E+00	0.000E+00
Eu-155	0.000E+00	2.597E-01	2.598E-01	2.619E-01	2.600E-01	1.392E-01	3.311E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	9.830E-16	9.836E-16	9.670E-16	9.828E-16	5.269E-16	5.020E-18	0.000E+00	0.000E+00
Np-237	0.000E+00	7.123E-06	7.205E-06	6.799E-06	6.924E-06	6.395E-07	2.805E-09	0.000E+00	0.000E+00
Pa-231	0.000E+00	5.157E-03	5.204E-03	4.953E-03	5.043E-03	2.964E-03	2.868E-06	0.000E+00	0.000E+00
Pb-210	0.000E+00	7.171E-07	6.491E-07	8.214E-07	8.619E-07	7.936E-08	2.430E-08	0.000E+00	0.000E+00
Ra-226	0.000E+00	8.262E-05	8.456E-05	7.514E-05	7.793E-05	6.135E-06	5.343E-06	0.000E+00	0.000E+00
Th-229	0.000E+00	2.379E-16	2.246E-16	2.684E-16	2.815E-16	1.585E-17	8.951E-19	0.000E+00	0.000E+00
Th-230	0.000E+00	3.321E-03	3.268E-03	3.405E-03	3.461E-03	1.966E-04	1.022E-05	0.000E+00	0.000E+00
U-233	0.000E+00	6.951E-12	5.986E-12	8.891E-12	9.152E-12	7.458E-13	1.010E-12	0.000E+00	0.000E+00
U-234	0.000E+00	3.008E+02	3.010E+02	3.011E+02	3.011E+02	2.742E+01	4.603E+01	0.000E+00	0.000E+00
U-235	0.000E+00	2.046E+01	2.047E+01	2.048E+01	2.048E+01	1.865E+00	3.131E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.884E+02	2.885E+02	2.887E+02	2.886E+02	2.628E+01	4.413E+01	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 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

```
1RESRAD, Version 6.5      T½ Limit = 180 days        03/06/2012  06:50  Page   8
 Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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
Ac-227	2.473E-04	2.473E-04	1.677E-09	0.000E+00	0.000E+00
Am-241	3.658E-01	3.658E-01	2.480E-06	0.000E+00	0.000E+00
Co-60	6.153E-03	6.153E-03	4.173E-08	0.000E+00	0.000E+00
Cs-137	2.215E-02	2.215E-02	1.502E-07	0.000E+00	0.000E+00
Eu-152	4.693E-02	4.693E-02	3.182E-07	0.000E+00	0.000E+00
Eu-154	3.682E-02	3.682E-02	2.497E-07	0.000E+00	0.000E+00
Eu-155	3.903E-02	3.903E-02	2.647E-07	0.000E+00	0.000E+00
Gd-152	1.103E-15	1.103E-15	7.482E-21	0.000E+00	0.000E+00
Np-237	1.194E-06	1.194E-06	8.099E-12	0.000E+00	0.000E+00
Pa-231	1.722E-03	1.722E-03	1.167E-08	0.000E+00	0.000E+00
Pb-210	2.249E-06	2.249E-06	1.525E-11	0.000E+00	0.000E+00
Ra-226	2.338E-05	2.338E-05	1.586E-10	0.000E+00	0.000E+00
Th-229	8.214E-15	8.214E-15	5.570E-20	0.000E+00	0.000E+00
Th-230	1.078E-02	1.078E-02	7.313E-08	0.000E+00	0.000E+00
U-233	2.603E-11	2.603E-11	1.765E-16	0.000E+00	0.000E+00
U-234	1.187E+02	1.187E+02	8.050E-04	0.000E+00	0.000E+00
U-235	8.074E+00	8.074E+00	5.475E-05	0.000E+00	0.000E+00
U-238	1.138E+02	1.138E+02	7.717E-04	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.

Attachment	2	Sheet No. 8 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 9
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	6.342E-04	6.199E-04	6.622E-04	6.685E-04	2.085E-05	3.208E-06	0.000E+00	0.000E+00
Am-241	0.000E+00	3.659E-01	3.664E-01	3.665E-01	3.665E-01	1.039E-02	4.061E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	4.923E-01	4.923E-01	4.959E-01	4.925E-01	7.311E-01	6.031E-02	0.000E+00	0.000E+00
Cs-137	0.000E+00	8.859E-01	8.859E-01	8.871E-01	8.860E-01	2.140E+00	4.784E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.173E-01	1.174E-01	1.177E-01	1.174E-01	6.289E-02	1.496E-03	0.000E+00	0.000E+00
Eu-154	0.000E+00	9.205E-02	9.210E-02	9.251E-02	9.213E-02	4.934E-02	1.174E-03	0.000E+00	0.000E+00
Eu-155	0.000E+00	9.758E-02	9.764E-02	9.839E-02	9.768E-02	5.231E-02	1.244E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	2.759E-15	2.760E-15	2.749E-15	2.760E-15	1.479E-15	1.407E-17	0.000E+00	0.000E+00
Np-237	0.000E+00	2.380E-05	2.388E-05	2.348E-05	2.361E-05	2.191E-06	9.477E-09	0.000E+00	0.000E+00
Pa-231	0.000E+00	1.717E-02	1.722E-02	1.697E-02	1.706E-02	1.005E-02	9.173E-06	0.000E+00	0.000E+00
Pb-210	0.000E+00	2.332E-05	2.256E-05	2.472E-05	2.509E-05	2.350E-06	7.563E-07	0.000E+00	0.000E+00
Ra-226	0.000E+00	9.284E-04	9.349E-04	9.030E-04	9.126E-04	7.298E-05	6.188E-05	0.000E+00	0.000E+00
Th-229	0.000E+00	8.364E-15	8.238E-15	8.604E-15	8.736E-15	4.955E-16	2.559E-17	0.000E+00	0.000E+00
Th-230	0.000E+00	1.085E-02	1.081E-02	1.094E-02	1.100E-02	6.240E-04	3.110E-05	0.000E+00	0.000E+00
U-233	0.000E+00	6.857E-11	6.536E-11	7.548E-11	7.621E-11	6.646E-12	1.032E-11	0.000E+00	0.000E+00
U-234	0.000E+00	2.968E+02	2.970E+02	2.971E+02	2.971E+02	2.705E+01	4.542E+01	0.000E+00	0.000E+00
U-235	0.000E+00	2.019E+01	2.020E+01	2.021E+01	2.021E+01	1.840E+00	3.089E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.846E+02	2.847E+02	2.848E+02	2.848E+02	2.593E+01	4.354E+01	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 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 10
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+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
Ac-227	1.801E-03	1.801E-03	1.221E-08	0.000E+00	0.000E+00
Am-241	3.536E-01	3.536E-01	2.398E-06	0.000E+00	0.000E+00
Co-60	4.404E-04	4.404E-04	2.987E-09	0.000E+00	0.000E+00
Cs-137	1.385E-02	1.385E-02	9.395E-08	0.000E+00	0.000E+00
Eu-152	1.656E-02	1.656E-02	1.123E-07	0.000E+00	0.000E+00
Eu-154	7.605E-03	7.605E-03	5.157E-08	0.000E+00	0.000E+00
Eu-155	2.381E-03	2.381E-03	1.615E-08	0.000E+00	0.000E+00
Gd-152	2.147E-15	2.147E-15	1.456E-20	0.000E+00	0.000E+00
Np-237	3.521E-06	3.521E-06	2.388E-11	0.000E+00	0.000E+00
Pa-231	5.049E-03	5.049E-03	3.424E-08	0.000E+00	0.000E+00
Pb-210	5.193E-05	5.193E-05	3.522E-10	0.000E+00	0.000E+00
Ra-226	2.067E-04	2.067E-04	1.402E-09	0.000E+00	0.000E+00
Th-229	2.175E-13	2.175E-13	1.475E-18	0.000E+00	0.000E+00
Th-230	3.171E-02	3.171E-02	2.150E-07	0.000E+00	0.000E+00
U-233	2.286E-10	2.286E-10	1.550E-15	0.000E+00	0.000E+00
U-234	1.143E+02	1.143E+02	7.748E-04	0.000E+00	0.000E+00
U-235	7.771E+00	7.771E+00	5.270E-05	0.000E+00	0.000E+00
U-238	1.095E+02	1.095E+02	7.428E-04	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.

Attachment	2	Sheet No. 10 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T½ Limit = 180 days 03/06/2012 06:50 Page 11
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

Concentration of radionuclides in foodstuff media
at t = 3.000E+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
Ac-227	0.000E+00	4.549E-03	4.508E-03	4.639E-03	4.653E-03	7.592E-05	2.312E-05	0.000E+00	0.000E+00
Am-241	0.000E+00	3.537E-01	3.542E-01	3.543E-01	3.543E-01	1.004E-02	3.926E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	3.523E-02	3.523E-02	3.549E-02	3.525E-02	5.233E-02	4.316E-03	0.000E+00	0.000E+00
Cs-137	0.000E+00	5.542E-01	5.542E-01	5.549E-01	5.543E-01	1.338E+00	2.993E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	4.140E-02	4.142E-02	4.155E-02	4.143E-02	2.219E-02	5.279E-04	0.000E+00	0.000E+00
Eu-154	0.000E+00	1.902E-02	1.903E-02	1.911E-02	1.903E-02	1.019E-02	2.425E-04	0.000E+00	0.000E+00
Eu-155	0.000E+00	5.954E-03	5.957E-03	6.003E-03	5.960E-03	3.191E-03	7.591E-05	0.000E+00	0.000E+00
Gd-152	0.000E+00	5.369E-15	5.372E-15	5.368E-15	5.372E-15	2.878E-15	2.738E-17	0.000E+00	0.000E+00
Np-237	0.000E+00	7.034E-05	7.042E-05	7.003E-05	7.015E-05	6.520E-06	2.809E-08	0.000E+00	0.000E+00
Pa-231	0.000E+00	5.044E-02	5.049E-02	5.026E-02	5.034E-02	2.969E-02	2.664E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	5.267E-04	5.199E-04	5.402E-04	5.428E-04	5.109E-05	1.679E-05	0.000E+00	0.000E+00
Ra-226	0.000E+00	8.248E-03	8.268E-03	8.174E-03	8.202E-03	6.588E-04	5.544E-04	0.000E+00	0.000E+00
Th-229	0.000E+00	2.189E-13	2.180E-13	2.209E-13	2.221E-13	1.260E-14	6.277E-16	0.000E+00	0.000E+00
Th-230	0.000E+00	3.178E-02	3.177E-02	3.191E-02	3.196E-02	1.813E-03	8.914E-05	0.000E+00	0.000E+00
U-233	0.000E+00	5.819E-10	5.726E-10	6.030E-10	6.050E-10	5.422E-11	8.852E-11	0.000E+00	0.000E+00
U-234	0.000E+00	2.857E+02	2.858E+02	2.860E+02	2.859E+02	2.604E+01	4.371E+01	0.000E+00	0.000E+00
U-235	0.000E+00	1.943E+01	1.944E+01	1.945E+01	1.945E+01	1.771E+00	2.973E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.739E+02	2.740E+02	2.741E+02	2.741E+02	2.496E+01	4.191E+01	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 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 12
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.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
Ac-227	1.092E-02	1.092E-02	7.408E-08	0.000E+00	0.000E+00
Am-241	3.141E-01	3.141E-01	2.130E-06	0.000E+00	0.000E+00
Co-60	4.321E-08	4.321E-08	2.930E-13	0.000E+00	0.000E+00
Cs-137	2.683E-03	2.683E-03	1.819E-08	0.000E+00	0.000E+00
Eu-152	4.321E-04	4.321E-04	2.930E-09	0.000E+00	0.000E+00
Eu-154	3.047E-05	3.047E-05	2.066E-10	0.000E+00	0.000E+00
Eu-155	1.336E-07	1.336E-07	9.058E-13	0.000E+00	0.000E+00
Gd-152	2.698E-15	2.698E-15	1.830E-20	0.000E+00	0.000E+00
Np-237	1.105E-05	1.105E-05	7.491E-11	0.000E+00	0.000E+00
Pa-231	1.555E-02	1.555E-02	1.055E-07	0.000E+00	0.000E+00
Pb-210	1.210E-03	1.210E-03	8.208E-09	0.000E+00	0.000E+00
Ra-226	2.158E-03	2.158E-03	1.464E-08	0.000E+00	0.000E+00
Th-229	7.536E-12	7.536E-12	5.111E-17	0.000E+00	0.000E+00
Th-230	9.865E-02	9.865E-02	6.690E-07	0.000E+00	0.000E+00
U-233	2.333E-09	2.333E-09	1.582E-14	0.000E+00	0.000E+00
U-234	9.994E+01	9.994E+01	6.777E-04	0.000E+00	0.000E+00
U-235	6.797E+00	6.797E+00	4.610E-05	0.000E+00	0.000E+00
U-238	9.581E+01	9.581E+01	6.497E-04	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.

Attachment	2	Sheet No. 12 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 13
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	2.746E-02	2.734E-02	2.777E-02	2.779E-02	3.064E-04	1.398E-04	0.000E+00	0.000E+00
Am-241	0.000E+00	3.142E-01	3.147E-01	3.148E-01	3.147E-01	8.923E-03	3.487E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	3.457E-06	3.457E-06	3.482E-06	3.458E-06	5.133E-06	4.234E-07	0.000E+00	0.000E+00
Cs-137	0.000E+00	1.073E-01	1.073E-01	1.075E-01	1.073E-01	2.592E-01	5.795E-02	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.080E-03	1.081E-03	1.084E-03	1.081E-03	5.791E-04	1.377E-05	0.000E+00	0.000E+00
Eu-154	0.000E+00	7.619E-05	7.623E-05	7.657E-05	7.626E-05	4.084E-05	9.714E-07	0.000E+00	0.000E+00
Eu-155	0.000E+00	3.340E-07	3.342E-07	3.368E-07	3.343E-07	1.790E-07	4.258E-09	0.000E+00	0.000E+00
Gd-152	0.000E+00	6.747E-15	6.751E-15	6.751E-15	6.751E-15	3.616E-15	3.441E-17	0.000E+00	0.000E+00
Np-237	0.000E+00	2.209E-04	2.209E-04	2.206E-04	2.207E-04	2.052E-05	8.831E-08	0.000E+00	0.000E+00
Pa-231	0.000E+00	1.555E-01	1.555E-01	1.553E-01	1.554E-01	9.168E-02	8.177E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	1.218E-02	1.211E-02	1.234E-02	1.235E-02	1.164E-03	3.858E-04	0.000E+00	0.000E+00
Ra-226	0.000E+00	8.628E-02	8.634E-02	8.605E-02	8.614E-02	6.929E-03	5.817E-03	0.000E+00	0.000E+00
Th-229	0.000E+00	7.552E-12	7.550E-12	7.580E-12	7.592E-12	4.305E-13	2.116E-14	0.000E+00	0.000E+00
Th-230	0.000E+00	9.874E-02	9.883E-02	9.896E-02	9.901E-02	5.614E-03	2.748E-04	0.000E+00	0.000E+00
U-233	0.000E+00	5.866E-09	5.838E-09	5.936E-09	5.942E-09	5.383E-10	8.959E-10	0.000E+00	0.000E+00
U-234	0.000E+00	2.499E+02	2.500E+02	2.501E+02	2.501E+02	2.277E+01	3.823E+01	0.000E+00	0.000E+00
U-235	0.000E+00	1.700E+01	1.701E+01	1.701E+01	1.701E+01	1.549E+00	2.601E+00	0.000E+00	0.000E+00
U-238	0.000E+00	2.396E+02	2.397E+02	2.398E+02	2.398E+02	2.183E+01	3.665E+01	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. 13 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 14
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	3.372E-02	3.372E-02	2.287E-07	0.000E+00	0.000E+00
Am-241	2.240E-01	2.240E-01	1.519E-06	0.000E+00	0.000E+00
Co-60	1.525E-19	1.525E-19	1.034E-24	0.000E+00	0.000E+00
Cs-137	2.463E-05	2.463E-05	1.670E-10	0.000E+00	0.000E+00
Eu-152	1.292E-08	1.292E-08	8.764E-14	0.000E+00	0.000E+00
Eu-154	4.312E-12	4.312E-12	2.924E-17	0.000E+00	0.000E+00
Eu-155	9.546E-20	9.546E-20	6.473E-25	0.000E+00	0.000E+00
Gd-152	2.702E-15	2.702E-15	1.832E-20	0.000E+00	0.000E+00
Np-237	2.804E-05	2.804E-05	1.901E-10	0.000E+00	0.000E+00
Pa-231	3.743E-02	3.743E-02	2.538E-07	0.000E+00	0.000E+00
Pb-210	1.343E-02	1.343E-02	9.111E-08	0.000E+00	0.000E+00
Ra-226	1.633E-02	1.633E-02	1.107E-07	0.000E+00	0.000E+00
Th-229	1.687E-10	1.687E-10	1.144E-15	0.000E+00	0.000E+00
Th-230	2.447E-01	2.447E-01	1.660E-06	0.000E+00	0.000E+00
U-233	1.655E-08	1.655E-08	1.122E-13	0.000E+00	0.000E+00
U-234	6.817E+01	6.817E+01	4.623E-04	0.000E+00	0.000E+00
U-235	4.637E+00	4.637E+00	3.144E-05	0.000E+00	0.000E+00
U-238	6.535E+01	6.535E+01	4.432E-04	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.

Attachment	2	Sheet No. 14 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 15
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	8.466E-02	8.438E-02	8.546E-02	8.547E-02	8.372E-04	4.312E-04	0.000E+00	0.000E+00
Am-241	0.000E+00	2.241E-01	2.244E-01	2.244E-01	2.244E-01	6.362E-03	2.487E-04	0.000E+00	0.000E+00
Co-60	0.000E+00	1.220E-17	1.220E-17	1.229E-17	1.220E-17	1.811E-17	1.494E-18	0.000E+00	0.000E+00
Cs-137	0.000E+00	9.853E-04	9.853E-04	9.866E-04	9.854E-04	2.380E-03	5.321E-04	0.000E+00	0.000E+00
Eu-152	0.000E+00	3.231E-08	3.233E-08	3.243E-08	3.234E-08	1.732E-08	4.120E-10	0.000E+00	0.000E+00
Eu-154	0.000E+00	1.078E-11	1.079E-11	1.084E-11	1.079E-11	5.780E-12	1.375E-13	0.000E+00	0.000E+00
Eu-155	0.000E+00	2.387E-19	2.388E-19	2.407E-19	2.389E-19	1.279E-19	3.043E-21	0.000E+00	0.000E+00
Gd-152	0.000E+00	6.755E-15	6.759E-15	6.759E-15	6.759E-15	3.621E-15	3.445E-17	0.000E+00	0.000E+00
Np-237	0.000E+00	5.607E-04	5.608E-04	5.606E-04	5.606E-04	5.214E-05	2.243E-07	0.000E+00	0.000E+00
Pa-231	0.000E+00	3.743E-01	3.744E-01	3.742E-01	3.743E-01	2.208E-01	1.966E-04	0.000E+00	0.000E+00
Pb-210	0.000E+00	1.349E-01	1.344E-01	1.362E-01	1.362E-01	1.285E-02	4.267E-03	0.000E+00	0.000E+00
Ra-226	0.000E+00	6.529E-01	6.531E-01	6.524E-01	6.526E-01	5.253E-02	4.406E-02	0.000E+00	0.000E+00
Th-229	0.000E+00	1.689E-10	1.690E-10	1.693E-10	1.694E-10	9.603E-12	4.700E-13	0.000E+00	0.000E+00
Th-230	0.000E+00	2.449E-01	2.452E-01	2.453E-01	2.453E-01	1.391E-02	6.800E-04	0.000E+00	0.000E+00
U-233	0.000E+00	4.146E-08	4.140E-08	4.166E-08	4.167E-08	3.788E-09	6.339E-09	0.000E+00	0.000E+00
U-234	0.000E+00	1.705E+02	1.705E+02	1.706E+02	1.706E+02	1.553E+01	2.608E+01	0.000E+00	0.000E+00
U-235	0.000E+00	1.159E+01	1.160E+01	1.160E+01	1.160E+01	1.057E+00	1.774E+00	0.000E+00	0.000E+00
U-238	0.000E+00	1.634E+02	1.635E+02	1.636E+02	1.636E+02	1.489E+01	2.500E+01	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. 15 of 17	
Originator:	M. W. Perrott	Date	3/7/2012
Chk'd By	S. W. Clark	Date	3/7/2012
Calc. No.	0300X-CA-V0155	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 16
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	5.956E-02	5.956E-02	4.039E-07	0.000E+00	0.000E+00
Am-241	6.856E-02	6.856E-02	4.649E-07	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	1.826E-12	1.826E-12	1.238E-17	0.000E+00	0.000E+00
Eu-152	1.891E-24	1.891E-24	1.283E-29	0.000E+00	0.000E+00
Eu-154	4.598E-36	4.598E-36	3.118E-41	0.000E+00	0.000E+00
Eu-155	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Gd-152	2.662E-15	2.662E-15	1.805E-20	0.000E+00	0.000E+00
Np-237	5.566E-05	5.566E-05	3.775E-10	0.000E+00	0.000E+00
Pa-231	6.132E-02	6.132E-02	4.159E-07	0.000E+00	0.000E+00
Pb-210	9.834E-02	9.834E-02	6.669E-07	0.000E+00	0.000E+00
Ra-226	1.030E-01	1.030E-01	6.985E-07	0.000E+00	0.000E+00
Th-229	3.392E-09	3.392E-09	2.300E-14	0.000E+00	0.000E+00
Th-230	4.560E-01	4.560E-01	3.092E-06	0.000E+00	0.000E+00
U-233	8.465E-08	8.465E-08	5.740E-13	0.000E+00	0.000E+00
U-234	1.787E+01	1.787E+01	1.212E-04	0.000E+00	0.000E+00
U-235	1.216E+00	1.216E+00	8.243E-06	0.000E+00	0.000E+00
U-238	1.713E+01	1.713E+01	1.162E-04	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.

Attachment 2 Sheet No. 16 of 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 03/06/2012 06:50 Page 17
Concent : UPR-300-38, 313 ESSP, 300-270 RESRAD Calculations for Focused Sample FS-11
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\300-38_UPR_313_ESSP_300-270.RAD

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
Ac-227	0.000E+00	1.495E-01	1.491E-01	1.508E-01	1.508E-01	1.430E-03	7.615E-04	0.000E+00	0.000E+00
Am-241	0.000E+00	6.859E-02	6.868E-02	6.870E-02	6.870E-02	1.948E-03	7.612E-05	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	7.305E-11	7.306E-11	7.315E-11	7.306E-11	1.764E-10	3.945E-11	0.000E+00	0.000E+00
Eu-152	0.000E+00	4.729E-24	4.732E-24	4.746E-24	4.733E-24	2.535E-24	6.030E-26	0.000E+00	0.000E+00
Eu-154	0.000E+00	1.150E-35	1.150E-35	1.155E-35	1.151E-35	6.163E-36	1.466E-37	0.000E+00	0.000E+00
Eu-155	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	6.656E-15	6.659E-15	6.660E-15	6.660E-15	3.568E-15	3.394E-17	0.000E+00	0.000E+00
Np-237	0.000E+00	1.113E-03	1.113E-03	1.113E-03	1.113E-03	1.035E-04	4.453E-07	0.000E+00	0.000E+00
Pa-231	0.000E+00	6.133E-01	6.133E-01	6.133E-01	6.133E-01	3.618E-01	3.220E-04	0.000E+00	0.000E+00
Pb-210	0.000E+00	9.871E-01	9.838E-01	9.954E-01	9.954E-01	9.389E-02	3.120E-02	0.000E+00	0.000E+00
Ra-226	0.000E+00	4.120E+00	4.120E+00	4.119E+00	4.119E+00	3.316E-01	2.781E-01	0.000E+00	0.000E+00
Th-229	0.000E+00	3.394E-09	3.398E-09	3.400E-09	3.400E-09	1.928E-10	9.423E-12	0.000E+00	0.000E+00
Th-230	0.000E+00	4.562E-01	4.568E-01	4.569E-01	4.569E-01	2.591E-02	1.266E-03	0.000E+00	0.000E+00
U-233	0.000E+00	2.118E-07	2.118E-07	2.123E-07	2.124E-07	1.932E-08	3.240E-08	0.000E+00	0.000E+00
U-234	0.000E+00	4.468E+01	4.471E+01	4.472E+01	4.472E+01	4.072E+00	6.837E+00	0.000E+00	0.000E+00
U-235	0.000E+00	3.040E+00	3.041E+00	3.042E+00	3.042E+00	2.770E-01	4.651E-01	0.000E+00	0.000E+00
U-238	0.000E+00	4.284E+01	4.286E+01	4.288E+01	4.288E+01	3.904E+00	6.555E+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. 17 of 17
Originator: M. W. Perrott Date 3/7/2012
Chk'd By S. W. Clark Date 3/7/2012
Calc. No. 0300X-CA-V0155 Rev. No. 0

APPENDIX B

DATA QUALITY ASSESSMENT

APPENDIX B

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2011b). This DQA was performed in accordance with site-specific data quality objectives found in the *300 Area Remedial Action Sampling and Analysis Plan* (300 Area SAP) (DOE-RL 2011).

A review of the sample design (WCH 2011b), the field logbook (WCH 2011a), 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 300 Area 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 UPR-300-38, 313 ESSP, and 300-270 waste sites were provided by the laboratories in five sample delivery groups (SDGs): SDG K3784, SDG K3785, SDG J01374, SDG J01405, and SDG KP0078. SDG K3784 was submitted for third-party validation. Major and minor deficiencies are discussed for the UPR-300-38, 313 ESSP, and 300-270 data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

MAJOR DEFICIENCIES

Due to the preparation holding time being exceeded by greater than twice the limit of 48 hours for nitrate, nitrite, and orthophosphate, third-party validation flagged the undetected nitrate, nitrite, and orthophosphate results in SDG K3784 as rejected, flagged with a "UR." The samples were collected on December 16, 2011, and they were analyzed on January 11, 2012. In addition, the preparation holding time was exceeded by greater than twice the limit of 48 hours for nitrate, nitrite, and orthophosphate in SDG K3785 and SDG J01374. The SDG K3785 samples were collected on December 19, 2011, and analyzed on January 11, 2011. The SDG J01374 samples were collected on December 19, 2011, and analyzed on December 26, 2011. The project flagged the undetected nitrite values for SDG K3785 and SDG J01374, and the undetected orthophosphate results for samples J1N0F9, J1N0H0, and J1N0H2 in SDG K3785 as rejected with a "UR" flag. The EPA analytical method 353.2 was requested to provide acceptable nitrate/nitrite data for decision-making purposes. Phosphate is not a regulated chemical under *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act-Cleanup."

The rejection of the undetected nitrate, nitrite, and orthophosphate data does not hinder the evaluation of the UPR-300-38, 313 ESSP, and 300-270 waste sites.

MINOR DEFICIENCIES

SDG K3784

This SDG comprises 9 statistical soil samples (J1N0C9, J1N0D2, J1N0F2-J1N0F7) and 11 focused samples (J1N0D0, J1N0D1, J1N0D3-J1N0D9, J1N0F0, J1N0F1, and J1N0F8) from the UPR-300-38, 313 ESSP, and 300-270 waste sites. These samples were analyzed for inductively coupled plasma (ICP) metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), ion chromatography (IC) anions, nitrate/nitrite, pH, isotopic uranium, strontium-90, and by gamma energy analysis (GEA). SDG K3784 was submitted for third-party validation. Minor deficiencies are as follows:

In the IC anions analysis, due to the preparation holding time being exceeded by greater than twice the limit of 48 hours for nitrate, nitrite, and orthophosphate, third-party validation flagged the nitrate results, except J1N0F6, in SDG K3784 as estimates, flagged with a "J." Third-party validation flagged the orthophosphate results for J1N0C9, J1N0D4, J1N0F0, and J1N0F7 as estimates, flagged with a "J." Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the IC anions analysis, the sulfate results for samples J1N0C9, J1N0D0, J1N0D2, J1N0D3, J1N0D4, J1N0D9, J1N0F4, J1N0F5, J1N0F6, and J1N0F7 were qualified as undetected and flagged "U" due to method-blank contamination. Estimated data are useable for decision-making purposes.

In the IC anions analysis, all sulfate results were considered estimated and flagged "J" by third-party validation due to a relative percent difference (RPD) above the quality control (QC) limit of 30%, at 128%. Estimated data are useable for decision-making purposes.

In the radionuclide analysis, all of the uranium-235 results were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS) analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the PCB analysis, all results for sample J1N0C9 were qualified by third-party validation as estimated with "J" flags due to a surrogate recovery below QC limits. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project-acceptance criteria for three analytes (aluminum, iron, and antimony). For aluminum and iron the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony did not have mismatched spike and native concentrations in the original MS. The original MS recovery for

antimony was 42.7%. All antimony data for SDG K3784 were considered estimated and flagged "J" by third-party validation due to the MS recoveries outside the QC limits. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all aluminum and antimony results were considered estimated and flagged "J" by third-party validation due to a laboratory control sample (LCS) outside QC limits at 137% and 69.4%, respectively. Estimated data are useable for decision-making purposes.

SDG K3785

This SDG comprises three statistical soil samples (J1N0H0, J1N0H2, and J1N0H4) and four focused soil samples (J1N0F9, J1N0H1, J1N0H3, and J1N0H5) from the UPR-300-38, 313 ESSP, and 300-270 waste sites. These samples were analyzed for ICP metals, mercury, PCBs, VOCs, IC anions, isotopic uranium, strontium-90, and by GEA. In addition, one equipment blank (J1N0H6) was collected and analyzed for ICP metals. Minor deficiencies are as follows:

In the IC anions analysis, due to the preparation holding time being exceeded by greater than twice the limit of 48 hours for nitrate, nitrite, and orthophosphate, the detected nitrate and orthophosphate results in SDG K3785 may be considered estimated. Estimated data are acceptable for decision-making purposes.

In the radionuclide analysis, all of the uranium-235 results may be considered estimated due to lack of an MS analysis. Estimated data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project-acceptance criteria for six analytes (aluminum, calcium, iron, manganese, antimony, and silicon). For aluminum, iron, manganese, and silicon, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony and calcium did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony and calcium were 39.3% and 222%, respectively. All antimony and calcium data for SDG K3785 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all silicon results may be considered estimated due to an LCS recovery outside QC limits at 56.1%. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all calcium results may be considered estimated due to a laboratory duplicate RPD outside QC limits at 42.5%. Estimated data are useable for decision-making purposes.

SDG KP0078

This SDG comprises a primary and duplicate pair (J1N3H0/J1N3H1), collected to replace the sample from the FS-14 location following further excavation. In addition, one equipment blank

(J1N3H2) was collected. These samples were analyzed for isotopic uranium and by GEA. Minor deficiencies are as follows:

In the radionuclide analysis, the uranium-235 result may be considered estimated due to lack of an LCS analysis. Estimated data are acceptable for decision-making purposes.

SDG J01374

This SDG comprises a split soil sample (J1N0H7) from the focused sample J1N0H5. This sample was analyzed for ICP metals, mercury, PCBs, IC anions, nitrate/nitrite, VOCs, isotopic uranium, strontium-90, and by GEA. Minor deficiencies are as follows:

In the radionuclide analysis, the uranium-235 result may be considered estimated due to lack of an LCS analysis. Estimated data are acceptable for decision-making purposes.

In the IC anions analysis, due to the preparation holding time being exceeded by greater than twice the limit of 48 hours for nitrate, nitrite, and orthophosphate, the detected nitrate and orthophosphate results in SDG J01374 may be considered estimated. Estimated data are acceptable for decision-making purposes.

In the PCB analysis, the MS and matrix spike duplicate (MSD) recoveries were outside the QC limits. The PCB results for SDG J01374 may be considered estimated. The data are useable for decision-making purposes.

In the VOC analysis, the MS and MSD recoveries were below the QC limits for carbon disulfide (44% and 42%), ethyl benzene (45% and 48%), styrene (43% and 45%), and xylene (43% and 47%). The MS recoveries for chlorobenzene (49%) and tetrachloroethene (48%) were below the QC limits. The results for these VOCs may be considered estimated. The data are useable for decision-making purposes.

In the VOC analysis, the MS/MSD RPD for 2-butanone (34%), ethylbenzene (32%), tetrachloroethene (34%), toluene (31%), and xylene (32%), are above the QC criteria of 30%. Results for these VOCs may be considered estimated. The data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project-acceptance criteria for six analytes (aluminum, iron, manganese, antimony, silicon, and uranium). For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony and silicon did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony, silicon, and uranium were 52%, 30%, and 42%, respectively. All antimony, silicon, and uranium data for SDG J01374 may be considered estimated. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the silicon result may be considered estimated due to an LCS below QC limits at 23%. Estimated data are useable for decision-making purposes.

SDG J01405

This SDG comprises a split soil sample (J1N3H3) from the focused sample J1N3H0, taken to replace the sample from the FS-14 location following further excavation. This sample was analyzed for isotopic uranium and by GEA. Minor deficiencies are as follows:

In the radionuclide analysis, the uranium-235 result may be considered estimated due to lack of an LCS analysis. Estimated data are acceptable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field quality assurance (QA)/QC measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbook (WCH 2011a), are the excavation FS-5 and FS-14 primary and duplicate samples (J1N0D8/J1N0F0 and J1N3H0/J1N3H1) and FS-1 and FS-14 primary and split samples (J1N0H5/J1N0H7 and J1N3H0/J1N3H3). The main and QA/QC sample results are presented in Appendix A.

Field duplicate and field split 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 and splits are evaluated by computing the RPD of the sample/duplicate and sample/split pair(s) for each contaminant of potential concern (COPC). RPDs are not calculated for analytes that are not detected in both the main and duplicate/split sample at more than five times the target detection limit. RPDs of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

The RPDs for uranium-233/234 (34.6%), uranium-238 (34.2), chromium (47.7%), copper (149.1%), chloride (136.9%), nitrate (144.3%), sulfate (110%), and aroclor-1254 (56.4%) in the FS-5 duplicate sample are above the acceptance criteria of 30%. The RPDs for lead (36.5%), silicon (32.9%), and aroclor-1260 (44.9%) in the FS-1 split sample are above the acceptance criteria of 30%. A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate and main and split) is less than five times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix A) to indicate that a visual check of the data is required by the reviewer. The uranium-233/234, aluminum, barium, calcium, chromium, copper, iron, magnesium, manganese, silicon, uranium, zinc, chloride, nitrate, nitrogen in nitrate and nitrite,

and sulfate data in the FS-5 duplicate sample required this check. The aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, silicon, uranium, vanadium, zinc, chloride, and sulfate, aroclor-1254, and aroclor-1260 data in the FS-1 split sample required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues, such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the UPR-300-38, 313 ESSP, and 300-270 waste sites verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for UPR-300-38, 313 ESSP, and 300-270 waste sites 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 A.

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