Date Submitted: 12/18/07 Originator: L. M. Dittmer Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 100-F-26:14 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-029

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed Out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:

The 100-F-26:14 waste site includes underground pipelines associated the 116-F-5 Ball Washer Crib and remnants of process pipelines on the west side of the 105-F Building. The site has been remediated and presently exists as an open excavation. Remediation and verification sampling of this site have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100 DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved: (1) evaluating the site using available process information, (2) remediating the site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the Remaining Sites ROD. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-F-26:14, 116-F5 Influent Pipelines* (attached).

Waste Site Controls:
Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

S. L. Charboneau DOE Federal Project Director (printed)	Stacy Charboneau Signature	1/29/08 Date
N/A Ecology Project Manager (printed)	Signature	Date
R. A. Lobos EPA Project Manager (printed)	Signature	2/29/08 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:14, 116-F-5 INFLUENT PIPELINES

Attachment to Waste Site Reclassification Form 2007-029

December 2007

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:14, 116-F-5 INFLUENT PIPELINES

EXECUTIVE SUMMARY

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area pre-reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site was divided into 16 subsites based on the intended use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 100-F-26:14 pipeline subsite consists of underground pipelines associated with the 116-F-5 Ball Washer Crib and remnants of process pipelines on the west side of the 105-F Building.

Portions of these pipelines were previously removed as evidenced by historical documentation as well as their absence during remediation. Confirmatory sampling was not performed because the presence of contamination related to the pipelines was already documented.

Remedial action at the 100-F-26:14 pipeline site was performed from February 1 through April 24, 2007. The site overlapped the footprint of the 118-F-8:4 (Fuel Storage Basin West Side Adjacent and Side Slope Soils) waste site and was remediated in conjunction with the latter. The portions where the two sites overlap have been interim closed out as part of the 118-F-8:4 waste site (WCH 2007a). The contaminants of potential concern for the 100-F-26:14 pipeline site were among the analytes included in the 118-F-8:4 waste site verification sampling.

Remediation of the 100-F-26:14 pipeline site resulted in disposal of approximately 700 bank cubic meters (BCM) (916 bank cubic yards [BCY]) of material to the Environmental Restoration Disposal Facility. Approximately 900 BCM (1,177 BCY) of overburden and layback soil was removed and stockpiled for use as clean backfill.

Verification sampling for the 100-F-26:14 pipeline site was performed in August 2007 (WCH 2007b) to collect data to determine if the remedial action goals had been met. A total of nine samples were collected (four from the excavation plus one duplicate; four from overburden stockpiles). The samples were analyzed by gamma energy analysis and for nickel-63, strontium-90, metals by inductively coupled plasma, mercury and hexavalent chromium. A summary of the cleanup evaluation for the soil results compared against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 100-F-26:14 waste site in accordance with the TPA-MP-14 (DOE-RL 2007) procedure.

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of

shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

A comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Screening levels were not exceeded, with the exception of antimony, boron, lead, manganese, and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors because concentrations of antimony, manganese, and vanadium are below site background levels, lead is within the range of Hanford Site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

Table ES-1. Summary of Remedial Action Goals for the 100-F-26:14 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure Radionuclides	Attain 15 mrem/yr dose rate above background over 1,000 years.	The maximum all pathways dose rate calculated by RESRAD is 10.0 and 2.72 mrem/yr at year zero (2007) from the overburden and layback stockpile area and excavation footprint, respectively.	Yes
Direct Exposure Nonradionuclides	Attain individual COC/COPC RAGs.	All individual COC/COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (4.6×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk values for individual carcinogens are $<1 \times 10^{-6}$.	
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk value (1.8×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COC/COPC groundwater and river protection RAGs.	None of the radionuclide COC/COPCs are predicted to reach groundwater. All single COC/COPC groundwater and river RAGs have therefore been attained.	Yes
	Attain national primary drinking water regulations:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	None of the radionuclide COC/COPCs are predicted to reach groundwater within 1,000 years.	

Table ES-1. Summary of Remedial Action Goals for the 100-F-26:14 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide from DOE Order 5400.5.[b]	None of the radionuclide COC/COPCs are predicted to reach groundwater within 1,000 years.	
	Meet total uranium standard of 21.2 pCi/L.[c]	The total uranium COC/COPCs (U-235 and U-238) are present at concentrations less than natural background.	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of barium and lead are above the groundwater and/or river protection RAGs. However, RESRAD modeling predicts these constituents will not reach groundwater (and therefore the Columbia River) within 1,000 years.[d]	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Areas, 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 2001a).
[d] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), these constituents are not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the lowest soil-partitioning coefficient distribution [barium] of 25 mL/g). The vadose zone underlying the remediation footprint is approximately 5 m (16 ft) thick.

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-26:14, 116-F-5 INFLUENT PIPELINES

STATEMENT OF PROTECTIVENESS

The 100-F-26:14 (116-F-5 influent pipelines) pipeline site verification sample results demonstrate that the site achieves the remedial action objectives and remedial action goals (RAGs) established in the Remedial Design Report/Remedial Action Work Plan for the 100 Area (RDR/RAWP) (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units* (commonly called the Remaining Sites Record of Decision [ROD]) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep-zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

A comparison against ecological risk screening levels has been made for the site contaminants of concern and other constituents. Screening levels were not exceeded with the exception of antimony, boron, lead, manganese, and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors because concentrations of antimony, manganese, and vanadium are below site background levels, lead is within the range of Hanford Site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-26 site includes the underground process and sanitary sewer pipelines associated with the 100-F Area reactor cooling water treatment facilities. For the confirmatory sampling effort, the 100-F-26 site was divided into 16 subsites based on the intended use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 16 subsites are as follows:

- 100-F-26:1 North process sewer collection pipelines
- 100-F-26:2 Process water pipelines to the aquatic biology and strontium gardens
- 100-F-26:3 184-F powerhouse pipelines
- 100-F-26:4 South process pipelines
- 100-F-26:5 190-F bypass pipelines
- 100-F-26:6 190-F reservoir pipelines

- 100-F-26:7 Sodium dichromate and sodium silicate pipelines
- 100-F-26:8 1607-F1 sanitary sewer pipelines
- 100-F-26:9 1607-F2 sanitary sewer pipelines
- 100-F-26:10 1607-F3 sanitary sewer pipelines
- 100-F-26:11 1607-F4 sanitary sewer pipelines
- 100-F-26:12 1.8 m (72 in.) main process sewer pipeline
- 100-F-26:13 108-F drain pipelines
- 100-F-26:14 116-F-5 influent pipelines
- 100-F-26:15 Miscellaneous pipelines associated with the 1608-F sump
- 100-F-26:16 Reactor cooling water pipelines.

This remaining sites verification package only addresses areas within the 100-F-26:14 subsite (116-F-5 influent pipelines). The 100-F-26:14 pipeline site is located southwest of the 105-F Building (Figure 1). It includes a 10.2-cm (4-in.) influent pipeline that runs from the 105-F Reactor Building to the 116-F-5 ball washer crib, two process pipelines (30.48-cm [12-in.] and 15.24-cm [6-in.]) that connected to a previously remediated process pipeline (100-F-19:2); and a short 15.24-cm [6-in.] cast-iron pipe (Figure 2).

The 116-F-5 ball washer crib was used to dispose of liquid decontamination wastes from the 105-F Reactor ball washer assembly. It served to clean and decontaminate small, steel-jacketed boron balls used in the Ball 3X safety system (WHC 1993a). The ball washer assembly was located in the transfer basin area of the 105-F Reactor Building. The crib has been remediated and interim closed out. The excavation for remediation of the ball washer crib has been fully backfilled and appears today as an unmarked gravel-covered field (BHI 2001b).

The 30.48-cm (12-in.) process line ran from the 115-F seal pit to the 60.96-cm (24-in.) process sewer south of the fuel storage basin (HEW 1944). The 15.24-cm (6-in.) process line received effluent from the tunnel eductor discharge (GE 1962) and joined with the process line from the 115-F seal pit prior to entering the process sewer. The process sewer was remediated between August 2001 and December 2002 (BHI 2003). The remedial design drawings also show a short 15.24-cm (6-in.) cast-iron pipeline off the end of the ball washer influent line near the 105-F Building (BHI 2000). A possible reference to this pipeline is made on drawing M-1904 F sheet 5 (GE 1954). The pipe is referenced by the notation "6 [inch] V.P. BELOW 12 [inch] V.P." with an arrow pointing to the 30.48-cm (12-in.) process line from the 115-F seal pit. No additional historical information is available regarding this pipe.

CONFIRMATORY SAMPLING ACTIVITIES

Nonintrusive Investigation Results

The project team conducted a site walkdown in August 2004. The objectives of the walkdown were to (1) verify the site location and (2) evaluate field conditions and possible sampling logistics (i.e., identify manholes to excavate and locate the pipelines for sampling). No manholes or junction boxes were observed at the ground surface during the walkdown. A geophysical survey of the 100-F-26:14 underground pipeline subsite was not performed.

Figure 1. 100-F-26:14 Subsite Location Map.

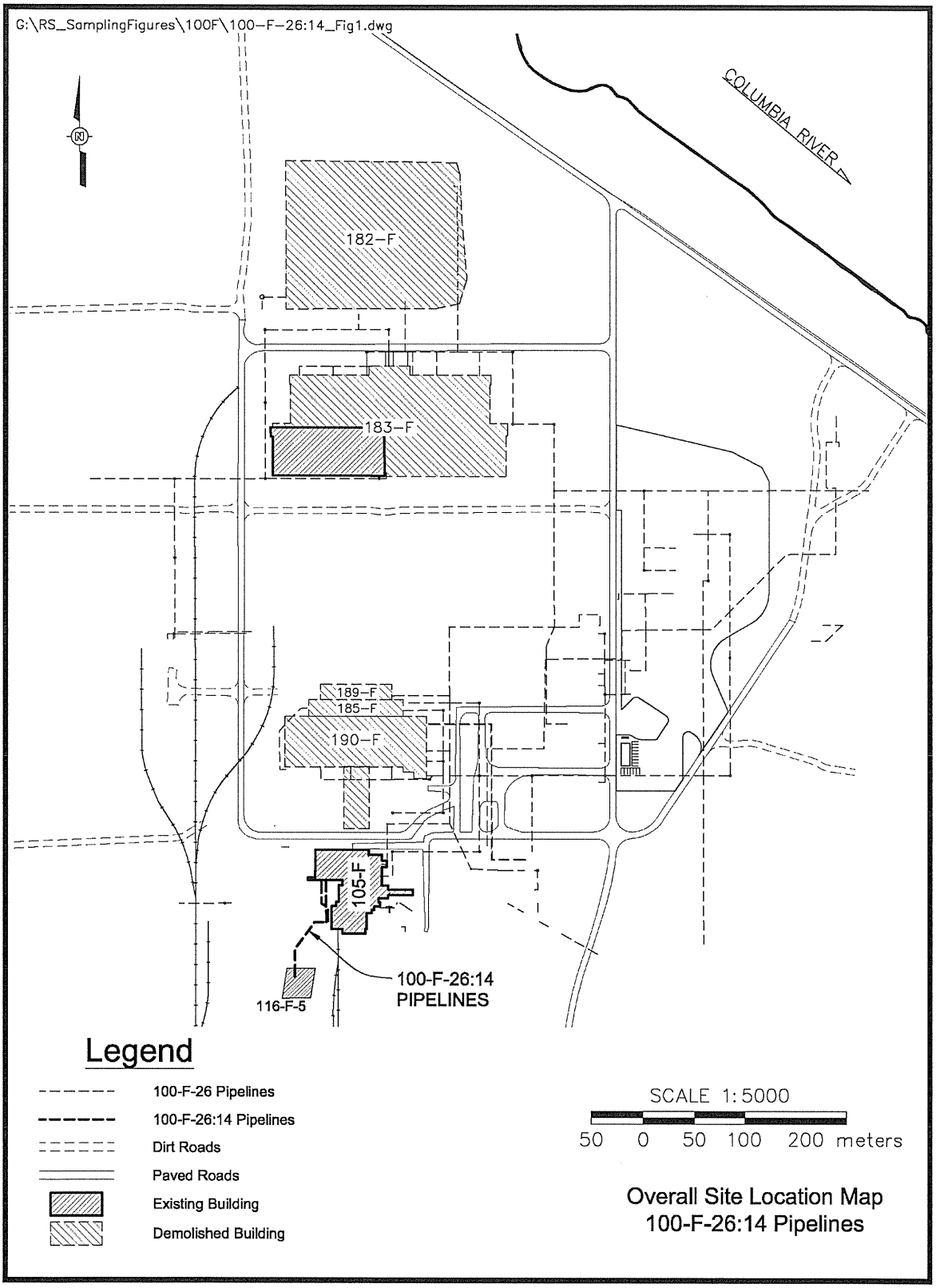
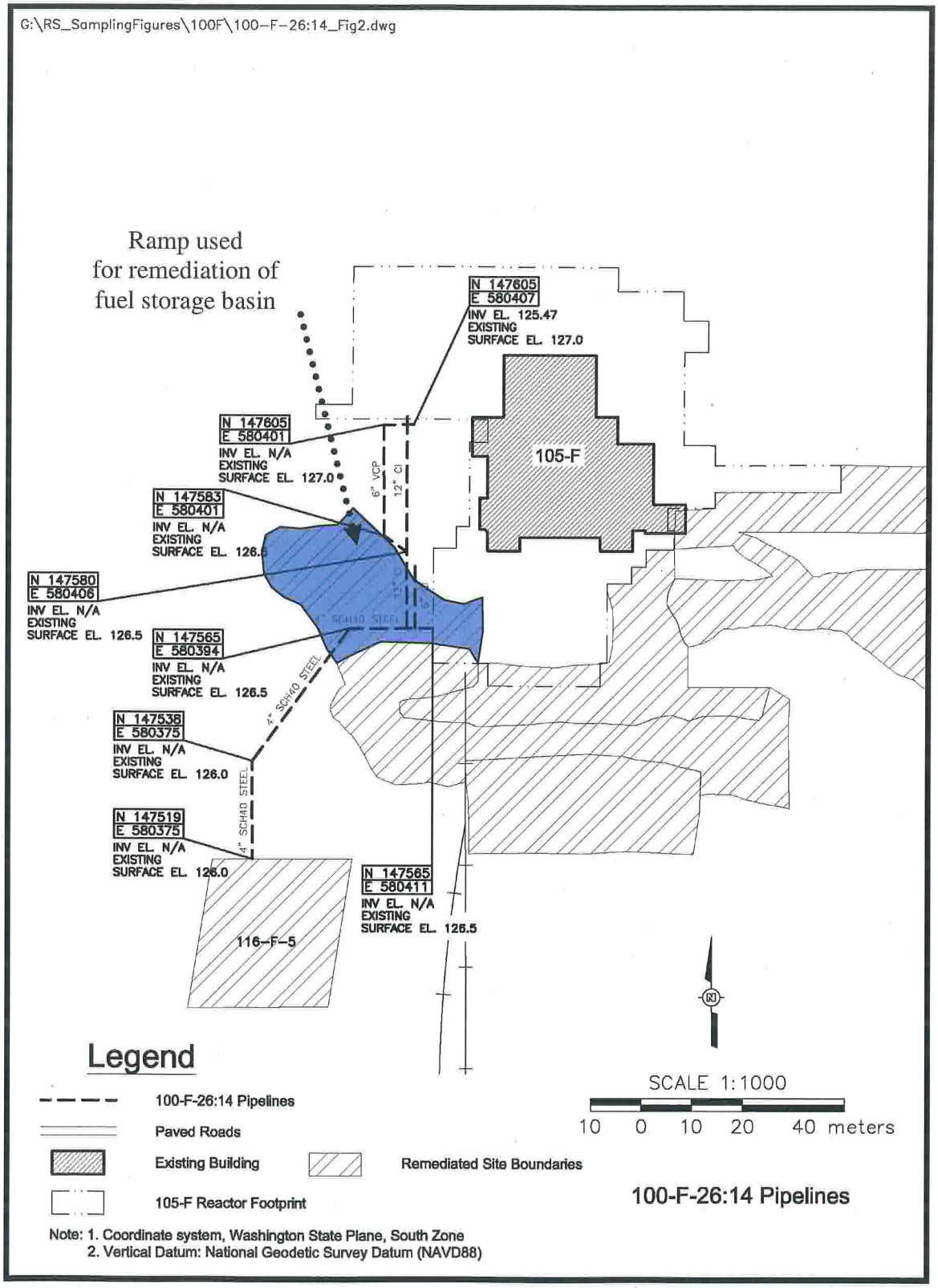


Figure 2. 100-F-26:14 Pipeline Detail.



Contaminants of Potential Concern

Contaminants of potential concern (COPCs) for the 100-F-26 underground pipeline waste site (including 100-F-26:14) are strontium-90, cesium-137, cobalt-60, europium-152, europium-154, hexavalent chromium, lead and metals (DOE-RL 2005a). Metals, in the context of the 100-F Area, are generally assumed to include arsenic, barium, cadmium, total chromium, mercury, selenium, and silver (in addition to hexavalent chromium and lead). The contaminants of concern (COCs) for the 116-F-5 ball washer crib consisted of cesium-137 and cobalt-60 (BHI 2001b). These COCs have been included in the COPC list for the 100-F-26:14 subsite.

Confirmatory Sampling

The site was sent directly to remediation, without confirmatory sampling, based on process knowledge and historical information (Feist 2005). Specifically, information contained in the cleanup verification package for the ball washer crib indicated that radiological contamination associated with the influent line may be present (BHI 2001b). The ball washer influent line was discovered in 1993 during excavation of the 116-F-4 (105-F Pluto Crib). The contaminated soil and approximately 36.5 m (120 ft) of the influent line was removed (DOE-RL 1996a, WHC 1993b). A portion of the pipeline remained near the southwest corner of the 105-F loading bay.

The disposition of the 100-F-26:14 pipelines was in doubt according to the waste site remove, treat, dispose (RTD) report (Feist 2005). Phase IV of the Interim Safe Storage project and the Remedial Action/Waste Disposal project both involved deep excavations in the area of the pipelines (Figures 3 - 6). The ramp created to facilitate excavation and backfilling of the fuel storage basin (FSB) was dug directly through the area where the 10.2-cm (4 in.) ball washer influent line, 30.48-cm (12 in.) process line and the short 15.24-cm (6 in.) pipeline would have been located. Figure 2 shows the location of the FSB ramp in relation to the pipelines. The RTD report indicated that the presence of the pipelines would be verified during remediation.

Figure 3. Excavation of Fuel Storage Basin (blue area at bottom left); excavators on ramp.

Figure 4. Excavation of 60.96-cm (24-in.) process sewer south of the fuel storage basin.

Figure 5. Ramp used for access to fuel storage basin during excavation and backfill.

Figure 6. Aerial photo showing areas excavated by Interim Safe Storage (ISS) and Remedial Action and Waste Disposal (RA/WD) projects (2002).

REMEDIAL ACTION SUMMARY

Remediation of the 100-F-26:14 pipeline site was performed from February 1 through April 24, 2007. The excavation cut through the middle of the 118-F-8:4 (fuel storage basin west side adjacent and side slope soils) waste site (Figure 7). The area bound by the 118-F-8:4 waste site has been interim closed out (WCH 2007a). The COC/COPCs for 100-F-26:14 were among other COCs sampled for the cleanup verification of the 118-F-8:4 remediation area. The total depth of the 118-F-8:4 (8 m [26 ft] below ground surface) was below the deepest (6 m [20 ft]) segment of the 100-F-26:14 pipeline. The post-excavation survey showing the former location of the pipelines is provided in Figure 8. The 100-F-26:14 pipeline segments within the area bounded by the 118-F-8:4 waste site interim closure is included therein. The boundaries for interim closure of the 100-F-26:14 pipelines are the areas extending outside the boundaries of 118-F-8:4 (Figure 9).

The volume of soil removed by the 100-F-26:14 excavation was approximately 1,600 BCM (2,093 BCY). Of this volume, approximately 700 BCM (916 BCY) of soil were disposed of at the Environmental Restoration Disposal Facility and 900 BCM (1,177 BCY) of overburden and layback soil were stockpiled for use as clean backfill.

The only pipeline discovered during remediation was a 15.24-cm (6-in.) vitrified clay pipe in a location where the 15.24-cm (6-in.) cast-iron pipe was expected. It was encased in concrete its entire length. The other pipelines are presumed to have been removed during previous remedial actions. There were no anomalies or stained soil discovered during remediation. Photographs of the remediation are provided in Appendix A.

Figure 7. 100-F-26:14 Post-Excavation Aerial Photograph (August 2007).

Figure 8. 100-F-26:14 Remediation Boundaries.

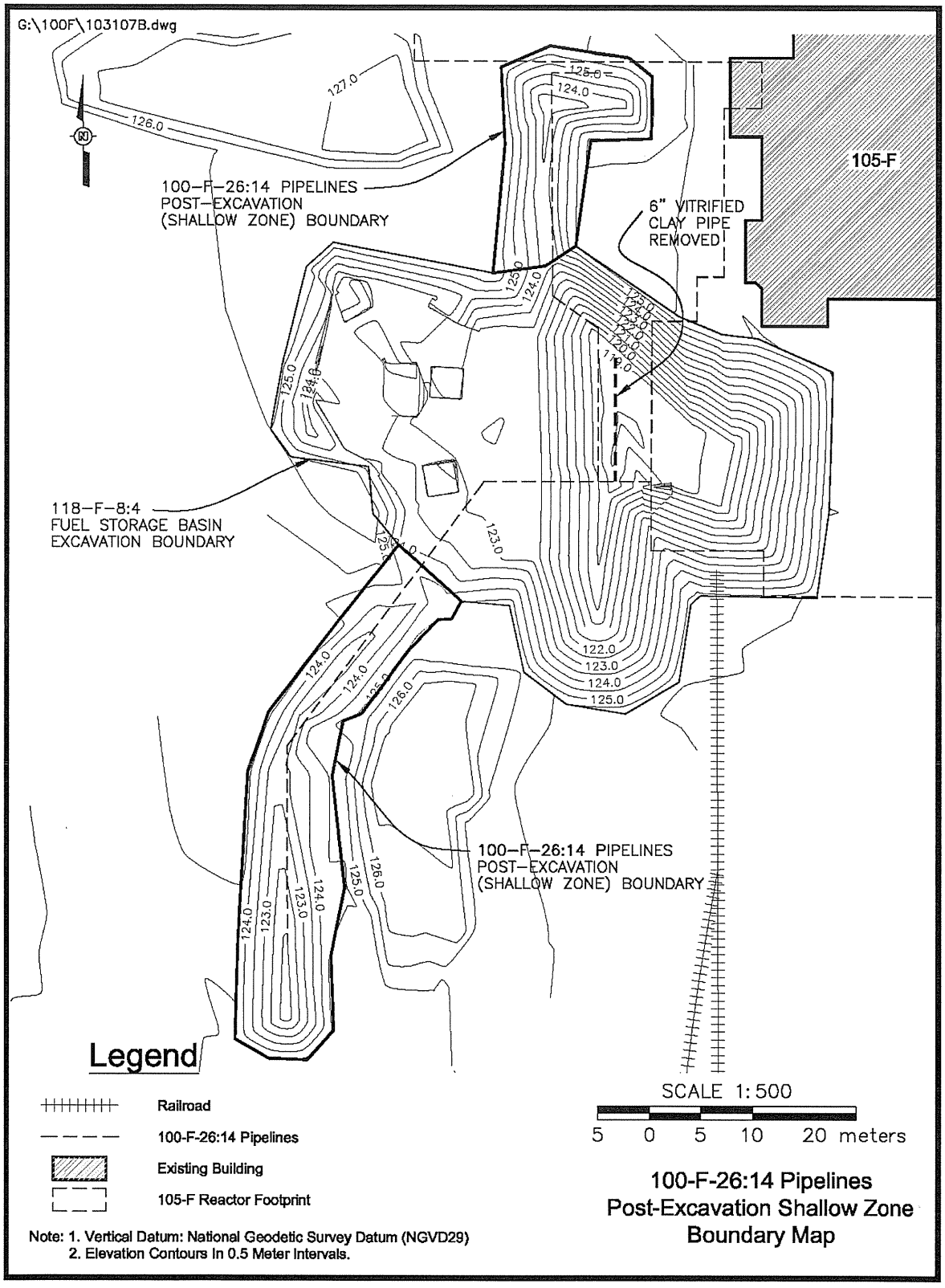
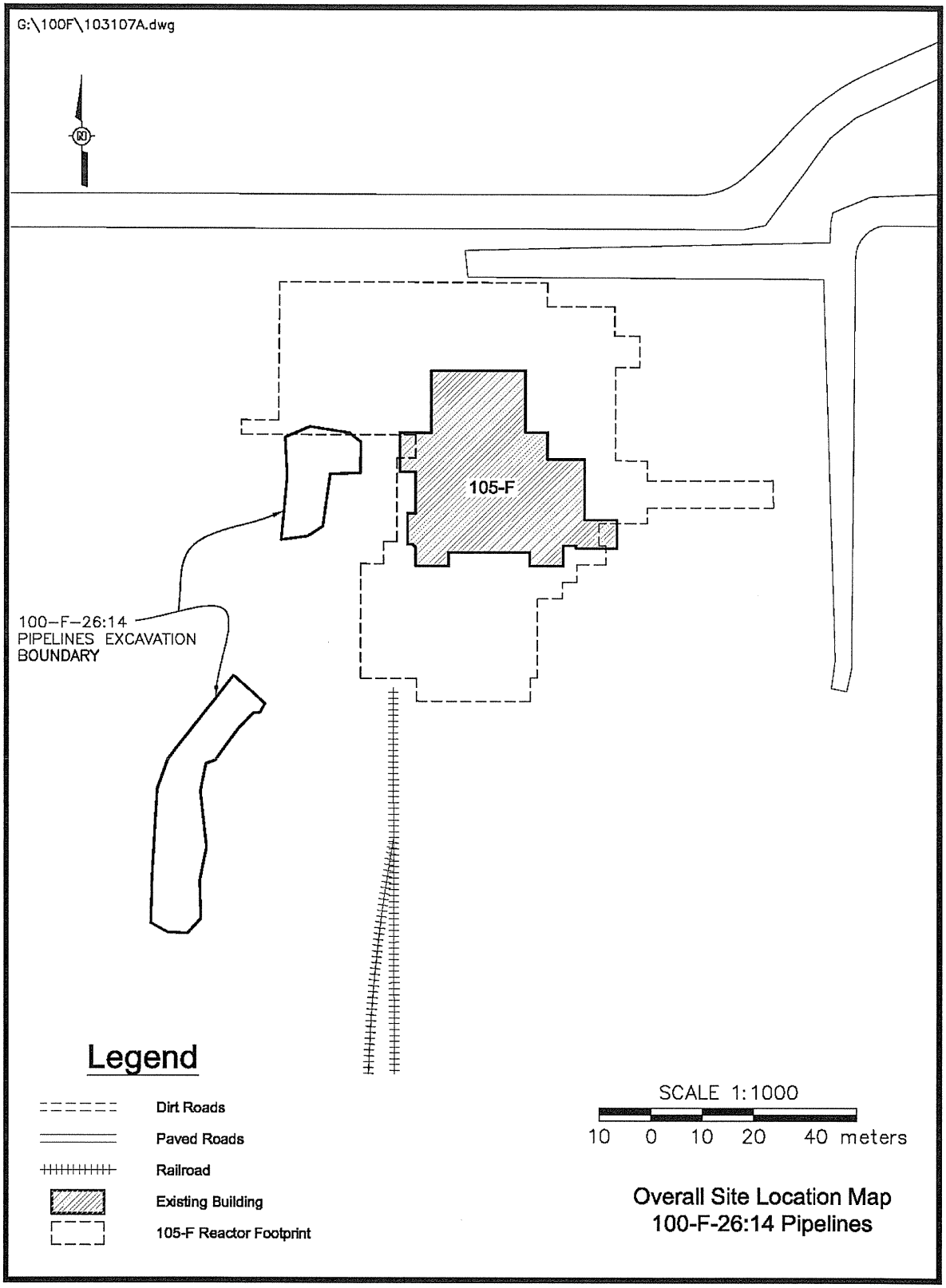


Figure 9. 100-F-26:14 Remediation Boundaries.



FIELD SCREENING

Radiological field screening was conducted during the site remedial actions. Field screening was used to guide the excavation to quickly assess the presence and level of contamination. Field screening at the site included using a radiological data mapping system survey (Global Positioning Environmental Radiological Surveyor [GPERS]) and hand-held sodium iodide (NaI) detectors. The radiological surveys completed in the excavation did not indicate the presence of radioactive contamination following remediation. Surveys of the overburden and layback stockpiles indicated an area of residual radiological activity. Initial verification sampling confirmed the presence of contaminants in excess of RAGs. Additional material was removed from this location, followed by surveys with hand-held instrumentation, which detected no residual radiological activity above background levels. Replacement verification samples were collected and analyzed from the remaining soils, using the same sample design and suite of analyses as previously used. The new data completely replaced the initial data for statistical calculations, comparison against RAGs, and calculation of risk. The results indicated that the remaining soil was suitable for use as backfill. The GPERS radiological surveys for the 100-F-26:14 pipeline site are provided in Appendix B of this document.

VERIFICATION SAMPLING ACTIVITIES

RAGs are the specific numeric goals against which the cleanup verification data are evaluated to demonstrate attainment of the remedial action objectives for the site. Verification sampling for the 100-F-26:14 pipeline site was performed on August 8, 9, and 21, 2007, (WCH 2007b) to collect data to determine if the RAGs had been met. The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Concern and Contaminants of Potential Concern for Verification Sampling

The COCs/COPCs for verification sampling were identified in the *100-F-26:14 Waste Site RTD Report* (Feist 2005) as strontium-90, cesium-137, cobalt-60, europium-152, europium-154, hexavalent chromium, arsenic, barium, cadmium, total chromium, lead, mercury, selenium, and silver. The verification samples were analyzed by gamma energy analysis and for nickel-63, strontium-90, metals by inductively coupled plasma analysis, mercury and hexavalent chromium which included all of the COCs/COPCs listed in the RTD report.

Verification Sampling Design

The sampling design for the 100-F-26:14 pipeline site was developed using the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005a). The site was divided into decision units (e.g., shallow zone and deep zone). These decision units are broken into smaller subunits based on surface area. The subunits are further broken into equal-sized sampling areas. Variance samples are collected from these sampling areas and analyzed. The results are used to determine the number of verification samples to collect in each decision unit.

The division of the site into decision units is also a function of the applicable RAGs. The direct exposure, groundwater protection, and river protection RAGs are applicable to soils within 4.6 m (15 ft)

of the ground surface. This soil zone is referred to as the shallow zone. The groundwater protection and river protection RAGs are applicable to soils greater than 4.6 m (15 ft) below the ground surface. This soil zone is referred to as the deep zone. There were no deep zones associated with the 100-F-26:14 pipeline site as defined herein.

The 100-F-26:14 pipeline site contains two decision units: (1) excavation footprint and (2) overburden and layback soil stockpiles. The calculation of the number of verification samples to collect in each of the decision units resulted in four composite samples being collected per decision unit for the shallow zone and overburden and layback stockpiles. This calculation, and the sample locations, is located in the sample design calculation in Appendix D. Figure 10 provides an overview of the two sample designs.

Verification Sampling Results

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. The laboratory-reported data results for all constituents are stored in the Environmental Remediation System (ENRE) project-specific database prior to submission for archival in the Hanford Environmental Information System (HEIS) site-wide database and are summarized in Appendix C.

Evaluation of the verification data from the two decision units (excavation footprint and overburden and layback stockpiles) was calculated using the 95% upper confidence limit on the true population mean for residual concentrations of COCs/COPCs. The calculations were also performed on other analytes included in the analysis requested for the COCs/COPCs. These calculations are provided in Appendix D. When a nonradionuclide analyte was detected in fewer than 50% of the verification samples collected, the maximum-detected value was used for comparison against the RAGs. If no detections for a given analyte were reported in the data set, then no statistical evaluation or calculations were performed for that analyte.

Comparisons of the statistical results for analytes with the shallow zone RAGs for the two decision units are summarized in Tables 1a and 1b. Both decision units are evaluated using the shallow zone cleanup criteria. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the *Cleanup Levels and Risk Calculations Database* (Ecology 2005) under *Washington Administrative Code* (WAC) 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COCs. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the site, but are not considered within statistical calculations or the following tables, as these isotopes are not related to the operational history of the site and were detected below background levels (based on an assumption of secular equilibrium, the background activities for radium-228 and thorium-228 are equal to the statistical background activity of 1.32 pCi/g for thorium-232 provided in DOE-RL 1996b).

Figure 10. Verification Soil Sample Locations at the 100-F-26:14 Pipeline Subsite.

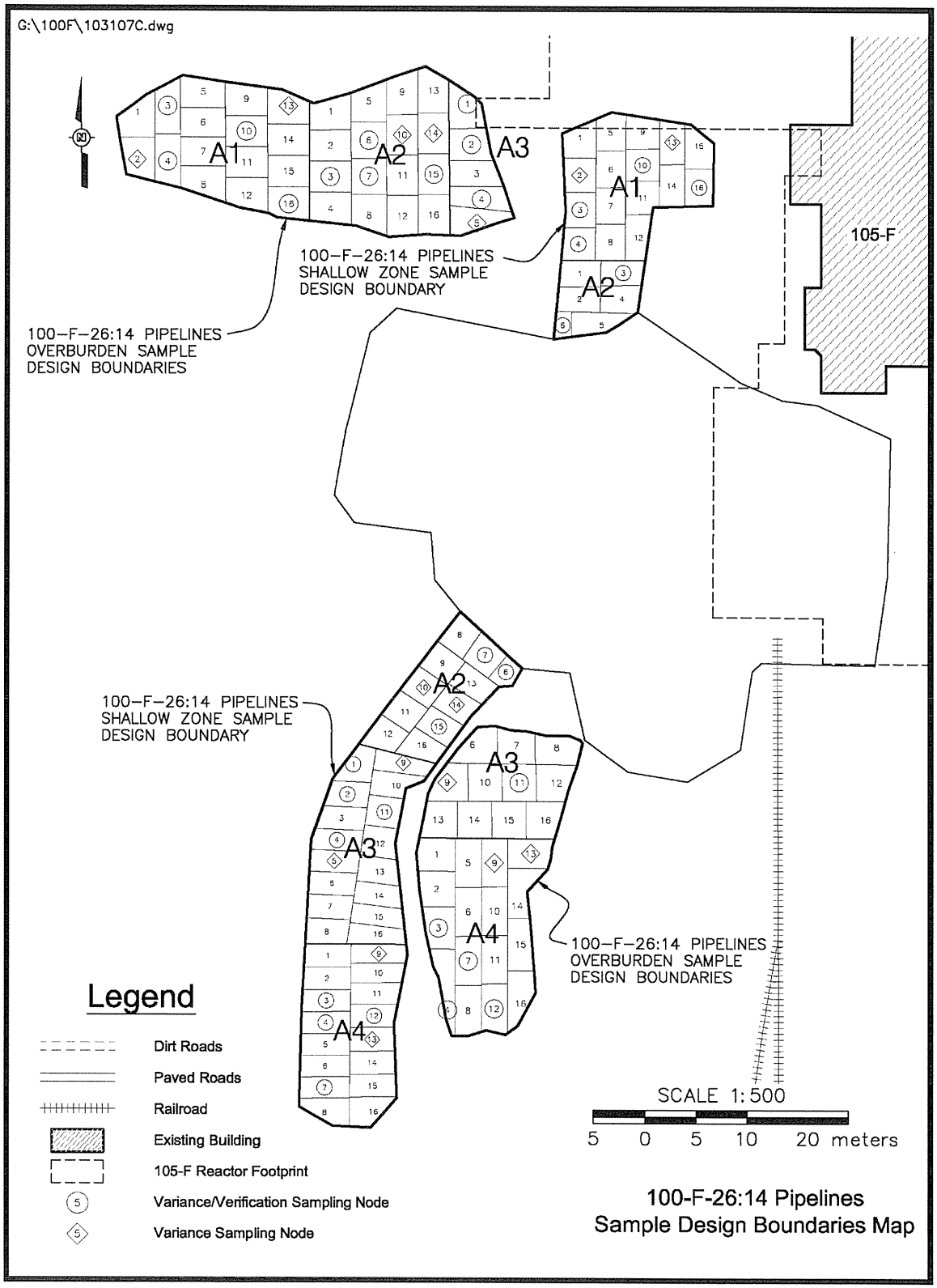


Table 1a. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:14 Excavation Footprint Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Groundwater Protection Lookup Value	River Protection Lookup Value		
Cesium-137	0.206 (<BG)	6.2	--[b]	--[b]	No	--
Cobalt-60	0.073	1.4	--[b]	--[b]	No	--
Europium-152	0.370	3.3	--[b]	--[b]	No	--
COCs/COPCs	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony[c]	0.79 (<BG)	32	5[d]	5[d]	No	--
Arsenic	2.8 (<BG)	20	20	20	No	--
Barium	101 (<BG)	5,600	132[c]	224	No	--
Beryllium	0.21 (<BG)	10.4[e]	1.51[d]	1.51[d]	No	--
Boron[f]	11.0	16,000	320	--[g]	No	--
Chromium (total)	9.3 (<BG)	80,000	18.5[d]	18.5[d]	No	--
Cobalt	6.3 (<BG)	1,600	32	--[g]	No	--
Copper	12.6 (<BG)	2,960	59.2	22.0[d]	No	--
Hexavalent Chromium	0.38	2.1[e]	4.8[h]	2	No	--
Lead	5.3 (<BG)	353	10.2[c]	10.2[d]	No	--
Manganese	272 (<BG)	11,200	512[d]	512[d]	No	--
Mercury	0.02 (<BG)	24	0.33[d]	0.33[d]	No	--
Molybdenum[f]	0.51	400	8	--[g]	No	--
Nickel	9.9 (<BG)	1,600	19.1[d]	27.4	No	--

Table 1a. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:14 Excavation Footprint Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Vanadium	39.6 (<BG)	560	85.1[d]	--[g]	No	--
Zinc	35.6 (<BG)	24,000	480	67.8[d]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil partitioning distribution coefficient (for cesium-137 and cobalt-60 [50 mL/g]), this contaminant is not predicted to migrate more than 1 m (3.3 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

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

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996 and DOE-RL 2005b).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

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

[g] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2005), and no bioconcentration factor or ambient water quality criteria values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[h] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in the Integrated Risk Information System) (EPA 2006).

-- = not applicable
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*

Table 1b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:14 Overburden and Layback Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Groundwater Protection Lookup Value	River Protection Lookup Value		
Cesium-137	1.43	6.2	--[b]	--[b]	No	--
Cobalt-60	0.179	1.4	--[b]	--[b]	No	--
Europium-152	1.07	3.3	--[b]	--[b]	No	--
Nickel-63	7.04	83	--[b]	--[b]	No	--
Strontium-90	0.304	4.5	--[b]	--[b]	No	--
COCs/COPCs	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Arsenic	2.9 (<BG)	20	20	20	No	--
Barium	90.1 (<BG)	5,600	132[c]	224	No	--
Beryllium	0.21 (<BG)	10.4[d]	1.51[e]	1.51[e]	No	--
Boron[f]	9.2	16,000	320	--[g]	No	--
Cadmium[c]	0.17 (<BG)	13.9[d]	0.81[e]	0.81[e]	No	--
Chromium (total)	9.4 (<BG)	80,000	18.5[e]	18.5[e]	No	--
Cobalt	6.5 (<BG)	1,600	32	--[g]	No	--
Copper	14.7 (<BG)	2,960	59.2	22.0[e]	No	--
Lead	15.1	353	10.2[c]	10.2[e]	Yes	Yes[h]
Manganese	297 (<BG)	11,200	512[e]	512[e]	No	--
Mercury	0.06 (<BG)	24	0.33[e]	0.33[e]	No	--
Molybdenum[f]	0.56	400	8	--[g]	No	--
Nickel	10.2 (<BG)	1,600	19.1[e]	27.4	No	--

Table 1b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-F-26:14 Overburden and Layback Stockpile Verification Sampling Event. (2 Pages)

COCs/COPCs	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Vanadium	40.3 (<BG)	560	85.1[e]	--[g]	No	
Zinc	38.7 (<BG)	24,000	480	67.8[e]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil partitioning distribution coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

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

[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], 1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

[e] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996 and DOE-RL 2005b).

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

[g] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2005), and no bioconcentration factor or ambient water quality criteria values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[h] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), residual concentrations are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the lowest soil-partitioning distribution coefficient [lead] of 30 mL/g). The vadose zone underlying the remediation footprint is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of all contaminants are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*

DATA EVALUATION

Evaluation of the results listed in Tables 1a and 1b indicate that one contaminant (lead) exceeds the soil RAGs for the protection of groundwater and/or the Columbia River in the overburden and layback stockpile decision unit. Data was not collected on the vertical extent of residual contamination, but, given the soil-partitioning coefficient (lead at 30 mL/g), RESRAD modeling (BHI 2005) predicts that it will not migrate more than 2 m (6.6 ft) vertically in 1,000 years. The vadose zone beneath the 100-F-26:14 excavation is approximately 7.8 m (25.6 ft) thick. Therefore, residual concentrations of these contaminants are protective of groundwater. The only pathway for contamination to reach the Columbia River is via groundwater migration, so this contaminant concentration is also protective of river water. All other contaminants for the 100-F-26:14 waste site were either not detected or quantified below RAGs. All of the residual contaminant concentrations were below the direct exposure RAGs.

For radionuclide contaminants, RESRAD modeling (ANL 2005) is used to predict the maximum dose rate, the excess lifetime cancer risk, and the impact on groundwater and the river from residual

radionuclide concentrations (DOE-RL 2005). For the 100-F-26:14 waste site excavation footprint and the overburden and layback stockpile area, the 95% UCL statistical concentrations of individual radionuclides in Table 1a and 1b, respectively, were entered into the RESRAD computer code with the results included in the RESRAD calculations in Appendix D. For the excavation footprint, a maximum dose of 2.72 mrem/yr was predicted to occur in the present year (2007) corresponding to a carcinogenic risk of 2.19×10^{-5}. For the overburden and layback stockpile area, a maximum dose of 10.0 mrem/yr was predicted to occur in the present year (2007) corresponding to a carcinogenic risk of 1.21×10^{-4}. Both dose and risk are predicted to decline over time due to radioactive decay. The RESRAD model predicts that no radionuclide from the 100-F-26:14 waste site will reach groundwater (or the river) within the 1,000 years of the evaluation. Therefore, residual concentrations of radionuclides are protective of groundwater and the river.

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 100-F-26:14 pipeline site is included in the statistical calculations (Appendix D). All residual COC/COPC concentrations for the 100-F-26:14 pipeline site pass the three-part test, except for barium and lead. As noted above, lead is not predicted to migrate more than 2 m (6.6 ft) vertically in 1,000 years. Barium with a slightly lower soil-partitioning coefficient (25 mL/g) is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years, Therefore, residual concentrations of barium and lead within these sampling areas are also protective of groundwater and the Columbia River.

Assessment of the risk requirements for the 100-F-26:14 pipeline site is determined by calculation of the hazard quotient and carcinogenic (excess cancer) risk values for nonradionuclides. These calculations are located in Appendix D. 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}. These risk values were conservatively calculated for the entire waste site using the highest values from each of the decision units. Risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. The calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-F-26:14 waste site is 4.6×10^{-2}. All individual cumulative carcinogenic risk values are less than 1×10^{-6}. The cumulative carcinogenic risk value is 1.8×10^{-7}. Therefore, nonradionuclide risk requirements are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA for the 100-F-26:14 pipeline site 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 evaluation verified that the sample design was sufficient for the purpose of clean site verification. The detailed DQA is presented in Appendix E.

SUMMARY FOR INTERIM CLOSURE

The 100-F-26:14 pipeline site has been remediated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). The site was remediated by removing approximately 700 BCM (916 BCY) of material for disposal at the Environmental Restoration Disposal Facility. Statistical sampling to verify the completeness of remediation was performed, and analytical results for the decision units (excavation footprint and overburden and layback stockpiles) were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. Accordingly, an interim closure reclassification is supported for the 100-F-26:14 pipeline site. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls.

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APPENDIX A

REMEDIATION PHOTOGRAPHS

Removing overburden at 100-F-26:14 waste site. (Looking northeast; west side of 105-F Bldg. visible.)

Removing overburden at 100-F-26:14/118-F-8:4 waste sites. (Looking east; west side of 105-F Bldg. visible.)

Excavating the 118-F-8:4 waste site. (Looking east; south side of 105-F Bldg. visible.)

Excavating pipe encased in concrete. (Looking southwest; near bottom of 118-F-8:4 waste site.)

Excavating pipe encased in concrete. (Looking east; near bottom of 118-F-8:4 waste site.)

Excavating pipe encased in concrete. (Looking south; former water tower foundation in foreground.)

Excavating pipe encased in concrete.
(Looking south.)

Excavation of pipe encased in concrete. (Looking southeast; former water tower foundation to the right.)

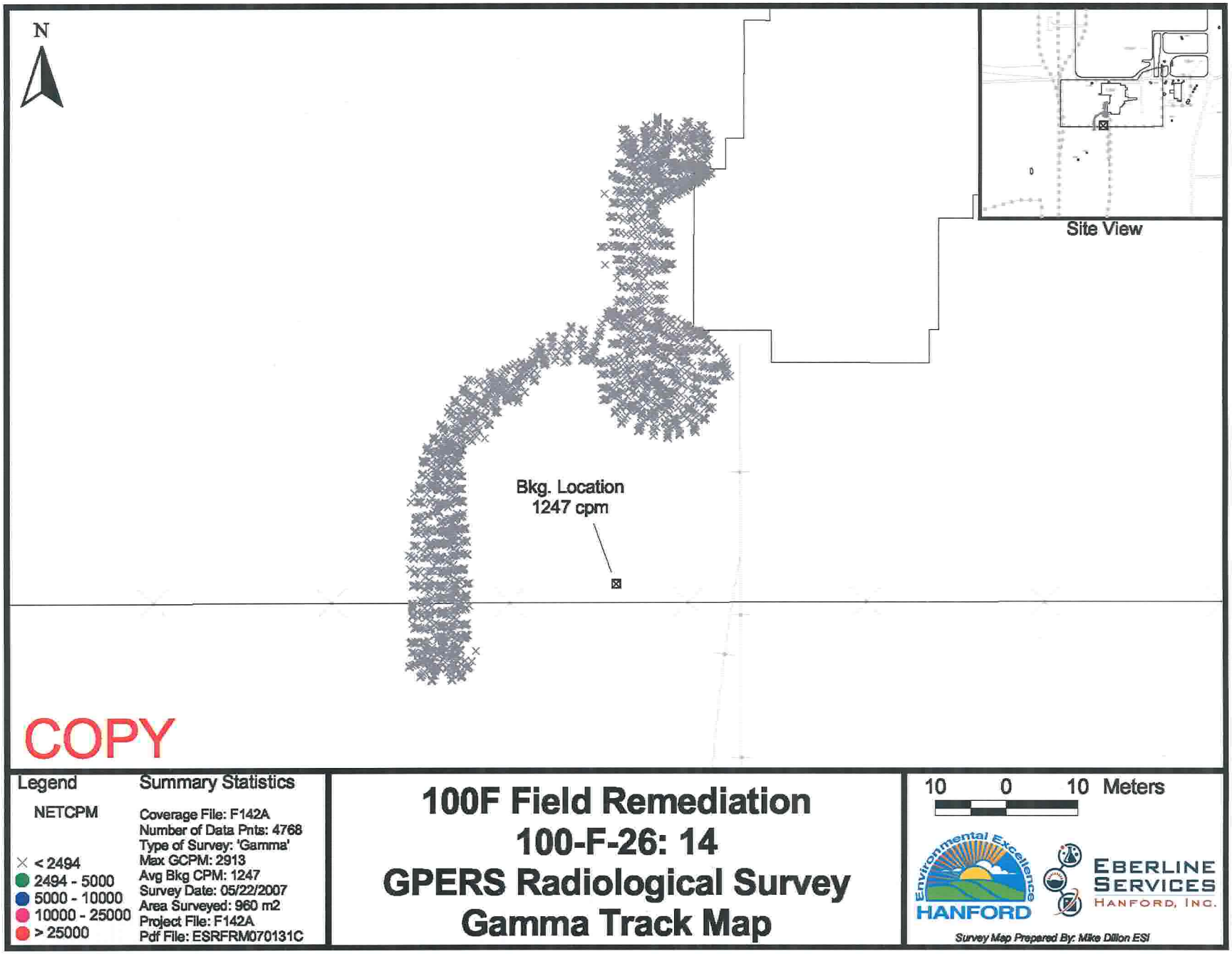
100-F-26:14/118-F-8:4 waste sites. (Looking northeast; May 24, 2007.)

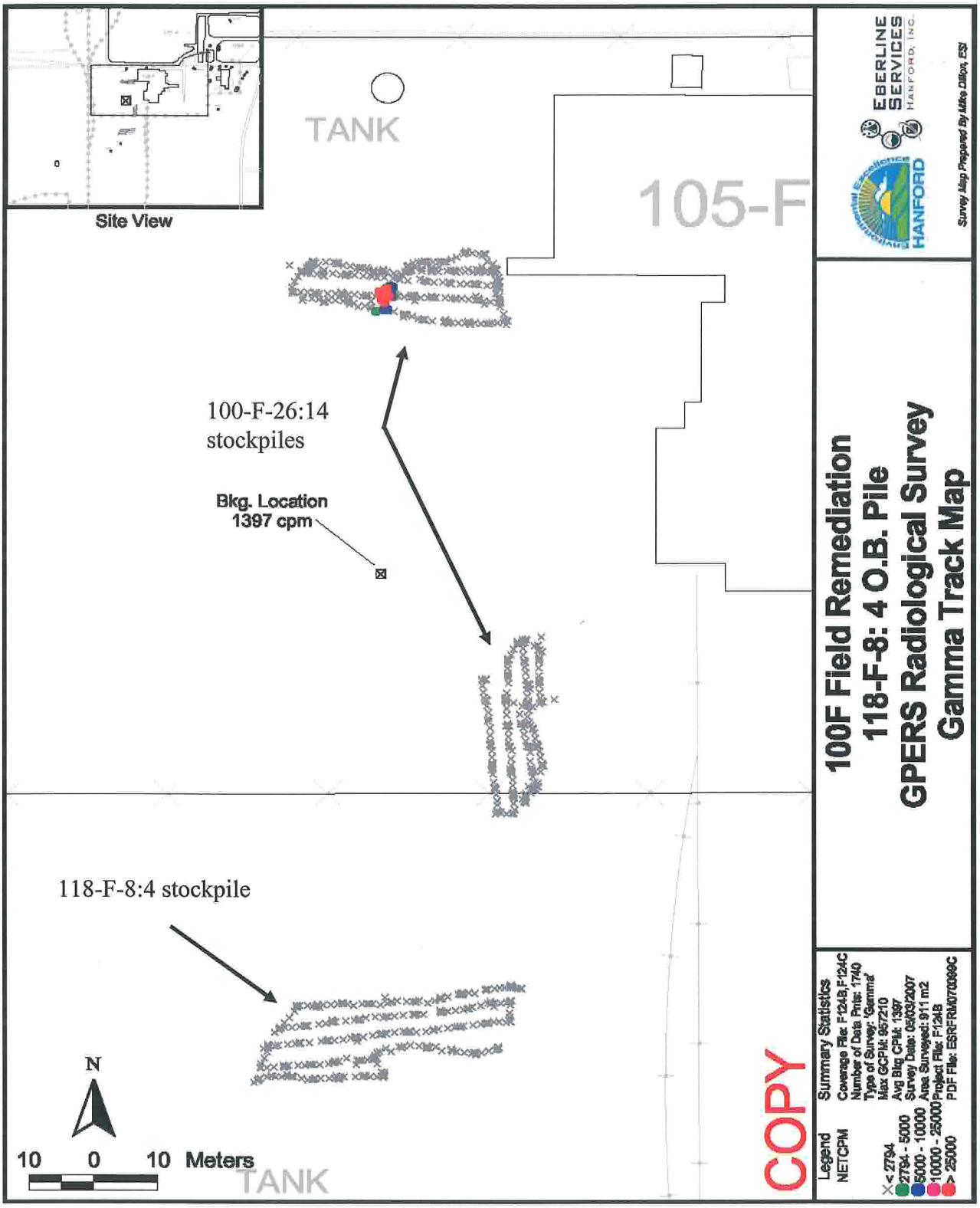
Southern half of 100-F-26:14 waste site. (Looking north; May 24, 2007.)

100-F-26:14 waste site backfill. (Looking southeast; October 16, 2007.)

APPENDIX B

POST-REMEDIATION RADIOLOGICAL SURVEYS


N
Site View
Bkg. Location
1247 cpm
COPY
Legend
NETCPM
< 2494
2494 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: F142A
Number of Data Pnts: 4768
Type of Survey: 'Gamma'
Max GCPM: 2913
Avg Bkg CPM: 1247
Survey Date: 05/22/2007
Area Surveyed: 960 m2
Project File: F142A
Pdf File: ESRFRM070131C
100F Field Remediation
100-F-26: 14
GPERS Radiological Survey
Gamma Track Map
10 0 10 Meters
Environmental Excellence
HANFORD
EBERLINE SERVICES
HANFORD, INC.
Survey Map Prepared By: Mike Dillon ESI


Site View
TANK
105-F
100-F-26:14
stockpiles
Bkg. Location
1397 cpm
118-F-8:4 stockpile
N
10 0 10 Meters
TANK
COPY
EBERLINE SERVICES
HANFORD, INC.
HANFORD
Survey Map Prepared By Mike Dillon, ESI
100F Field Remediation
118-F-8: 4 O.B. Pile
GPERS Radiological Survey
Gamma Track Map
Legend
NETCPM
< 2794
2794 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: F124B,F124C
Number of Data Pnts: 1740
Type of Survey: 'Gamma'
Max GCPM: 957210
Avg Bkg CPM: 1397
Survey Date: 08/03/2007
Area Surveyed: 911 m2
Project File: F124B
PDF File: ESRFRM070809C

APPENDIX C

100-F-26:14 PIPELINE SUBSITE VERIFICATION DATA SUMMARY TABLES

Table C-1. 100-F-26:14 Radionuclide Data Results.

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Americium-241 GEA			Barium-133			Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.263	U	0.263	0.085	U	0.085	1.96		0.076	0.252		0.074	1.36		0.185
OB A-2	J15BV3	8/8/07	0.143	U	0.143	0.029	U	0.029	0.521		0.027	0.043		0.021	0.527		0.058
OB A-3	J15BV4	8/8/07	0.133	U	0.133	0.060	U	0.060	0.410		0.042	0.040	U	0.040	0.576		0.091
OB A-4	J15FF5	8/21/07	0.073	U	0.073	0.082	U	0.082	0.090		0.083	0.087	U	0.087	0.210	U	0.210
SZ A-1	J15BV6	8/9/07	0.277	U	0.277	0.041	U	0.041	0.118		0.035	0.043	U	0.043	0.113		0.086
SZ A-2	J15BV7	8/9/07	0.307	U	0.307	0.044	U	0.044	0.263		0.044	0.055		0.043	0.525		0.105
SZ A-3	J15BV8	8/9/07	0.145	U	0.145	0.029	U	0.029	0.076		0.027	0.022	U	0.022	0.062	U	0.062
SZ A-3 Dup	J15BV9	8/9/07	0.120	U	0.120	0.055	U	0.055	0.085		0.035	0.036	U	0.036	0.102	U	0.102
SZ A-3 Split	J15BW2	8/9/07				-0.004	U	0.014	0.081		0.016	0.008	U	0.016	0.012	U	0.036
SZ A-4	J15BW0	8/9/07	0.043	U	0.043	0.027	U	0.027	0.061		0.030	0.089		0.031	0.058	U	0.058

Sample Location	HEIS Number	Sample Date	Europium-154			Europium-155			Nickel-63			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.247	U	0.247	0.174	U	0.174	9.62		3.19	12.1		0.720	0.405		0.157
OB A-2	J15BV3	8/8/07	0.076	U	0.076	0.082	U	0.082	1.97	U	3.25	13.3		0.234	0.407		0.044
OB A-3	J15BV4	8/8/07	0.132	U	0.132	0.185	U	0.185	1.26	U	3.33	15.0		0.264	0.464		0.064
OB A-4	J15FF5	8/21/07	0.242	U	0.242	0.157	U	0.157	2.50	U	3.24	6.34		0.700	0.246		0.150
SZ A-1	J15BV6	8/9/07	0.124	U	0.124	0.103	U	0.103	0.128	U	3.60	14.4		0.332	0.413		0.074
SZ A-2	J15BV7	8/9/07	0.135	U	0.135	0.117	U	0.117	3.24	U	3.50	13.3		0.360	0.433		0.085
SZ A-3	J15BV8	8/9/07	0.075	U	0.075	0.083	U	0.083	-0.310	U	3.73	13.4		0.245	0.484		0.043
SZ A-3 Dup	J15BV9	8/9/07	0.127	U	0.127	0.094	U	0.094	-0.286	U	3.44	13.4		0.369	0.416		0.054
SZ A-3 Split	J15BW2	8/9/07	0.010	U	0.052	0.014	U	0.039	-0.293	U	6.28						
SZ A-4	J15BW0	8/9/07	0.077	U	0.077	0.064	U	0.064	1.45	U	3.38	14.6		0.199	0.414		0.043

Sample Location	HEIS Number	Sample Date	Radium-228			Silver-108 metastable			Thorium-228 GEA			Thorium-232 GEA			Strontium-90		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.980	U	0.980	0.063	U	0.063	0.325		0.145	0.980	U	0.980	0.373		0.214
OB A-2	J15BV3	8/8/07	0.594		0.098	0.018	U	0.018	0.625		0.032	0.594		0.098	0.153	U	0.246
OB A-3	J15BV4	8/8/07	0.832		0.160	0.031	U	0.031	0.942		0.084	0.832		0.160	0.186		0.179
OB A-4	J15FF5	8/21/07	0.292		0.266	0.056	U	0.056	0.431		0.101	0.292		0.266	0.006	U	0.226
SZ A-1	J15BV6	8/9/07	0.753		0.146	0.026	U	0.026	0.619		0.046	0.753		0.146	-0.005	U	0.200
SZ A-2	J15BV7	8/9/07	0.590		0.176	0.030	U	0.030	0.645		0.054	0.590		0.176	0.148	U	0.263
SZ A-3	J15BV8	8/9/07	0.609		0.108	0.017	U	0.017	0.599		0.034	0.609		0.108	-0.097	U	0.302
SZ A-3 Dup	J15BV9	8/9/07	0.660		0.128	0.027	U	0.027	0.779		0.056	0.660		0.128	0.019	U	0.220
SZ A-3 Split	J15BW2	8/9/07				-0.003	U	0.011							-0.021	U	0.154
SZ A-4	J15BW0	8/9/07	0.708		0.092	0.018	U	0.018	0.646		0.028	0.708		0.092	0.006	U	0.269

Sample Location	HEIS Number	Sample Date	Uranium-235 GEA			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.270	U	0.270	9.43	U	9.43
OB A-2	J15BV3	8/8/07	0.109	U	0.109	2.83	U	2.83
OB A-3	J15BV4	8/8/07	0.186	U	0.186	4.66	U	4.66
OB A-4	J15FF5	8/21/07	0.270	U	0.270	9.14	U	9.14
SZ A-1	J15BV6	8/9/07	0.149	U	0.149	4.01	U	4.01
SZ A-2	J15BV7	8/9/07	0.169	U	0.169	4.53	U	4.53
SZ A-3	J15BV8	8/9/07	0.162	U	0.162	2.80	U	2.80
SZ A-3 Dup	J15BV9	8/9/07	0.148	U	0.148	4.36	U	4.36
SZ A-3 Split	J15BW2	8/9/07						
SZ A-4	J15BW0	8/9/07	0.105	U	0.105	2.90	U	2.90

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

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table C-2. 100-F-26:14 Inorganic Data Results. (2 Pages)

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	5460	C	4.9	0.65	U	0.65	3.1		1.2	56.5	C	0.06	0.03	U	0.03
OB A-2	J15BV3	8/8/07	4960		4.8	0.63	U	0.63	2.5		1.2	61.7	C	0.06	0.03	U	0.03
OB A-3	J15BV4	8/8/07	6100		5.0	0.66	U	0.66	2.6		1.2	63.5	C	0.06	0.03	U	0.03
OB A-4	J15FF5	8/21/07	6750	C	4.9	0.65	U	0.65	2.5		1.2	105	C	0.06	0.21	C	0.03
SZ A-1	J15BV6	8/9/07	5740	C	4.9	0.65	UJ	0.65	2.0		1.2	55.8	C	0.06	0.20		0.03
SZ A-2	J15BV7	8/9/07	5850	C	4.8	0.69	J	0.63	3.1		1.2	58.5	C	0.06	0.20		0.03
SZ A-3	J15BV8	8/9/07	6920	C	5.0	0.83	J	0.66	1.8		1.2	216	C	0.06	0.33		0.03
SZ A-3 Dup	J15BV9	8/9/07	2430	C	4.8	0.79	J	0.64	1.2	U	1.2	32.6	C	0.06	0.08		0.03
SZ A-3 Split	J15BW2	8/9/07	6510		5.1	1.4	B	1.0	1.8	B	0.5	67.9		0.46	0.25	B	0.14
SZ A-4	J15BW0	8/9/07	4310	C	4.8	0.63	UJ	0.63	2.4		1.2	49.0	C	0.06	0.16		0.03

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium (total)			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	1.2	C	1.1	0.15	U	0.15	5250		2.1	7.6	C	0.29	0.21	U	0.20
OB A-2	J15BV3	8/8/07	1.0	U	1.0	0.16		0.14	4060	C	2.0	7.5	C	0.29	0.20	U	0.20
OB A-3	J15BV4	8/8/07	1.1	U	1.1	0.19		0.15	5620	C	2.1	9.2	C	0.30	0.20	U	0.20
OB A-4	J15FF5	8/21/07	13.5	C	1.1	0.15	U	0.15	6200		2.1	9.7	C	0.30	0.20	U	0.20
SZ A-1	J15BV6	8/9/07	1.1	U	1.1	0.15	U	0.15	6260	C	2.1	9.1	C	0.30	0.32		0.20
SZ A-2	J15BV7	8/9/07	1.6		1.0	0.14	U	0.14	4230	C	2.0	9.5	C	0.29	0.25		0.20
SZ A-3	J15BV8	8/9/07	31.6		1.1	0.15	U	0.15	7630	C	2.1	8.0	C	0.30	0.28		0.20
SZ A-3 Dup	J15BV9	8/9/07	1.0	U	1.0	0.14	U	0.14	1690	C	2.1	4.2	C	0.29	0.50		0.20
SZ A-3 Split	J15BW2	8/9/07	13.6	B	3.0	0.12	U	0.12	4970		60.2	9.4		0.45	0.35	U	0.35
SZ A-4	J15BW0	8/9/07	1.3		1.0	0.14	U	0.14	3000	C	2.0	6.9	C	0.29	0.36		0.20

Sample Location	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	5.6		0.24	12.2		0.26	14100	C	7.0	3.7		0.97	3440	C	2.4
OB A-2	J15BV3	8/8/07	6.2		0.23	12.6	C	0.26	15900	C	6.9	4.2		0.95	3410	C	2.3
OB A-3	J15BV4	8/8/07	6.8		0.24	13.9	C	0.27	18100	C	7.1	20.4		0.98	4030	C	2.4
OB A-4	J15FF5	8/21/07	5.7		0.24	15.3		0.27	14400	C	7.1	5.9		0.98	3660	C	2.4
SZ A-1	J15BV6	8/9/07	6.0	C	0.24	12.5		0.27	15400	C	7.1	5.9		0.98	3670	C	2.4
SZ A-2	J15BV7	8/9/07	6.6	C	0.23	12.5		0.26	16700	C	6.8	4.8		0.95	3820	C	2.3
SZ A-3	J15BV8	8/9/07	6.0	C	0.24	13.2		0.27	13000	C	7.1	4.1		0.98	3820	C	2.4
SZ A-3 Dup	J15BV9	8/9/07	2.7	C	0.23	5.4		0.26	6500	C	6.9	1.9		0.95	1720	C	2.3
SZ A-3 Split	J15BW2	8/9/07	7.4	B	0.46	11.3		0.80	15600		7.5	5.8		0.60	3760		18
SZ A-4	J15BW0	8/9/07	5.0	C	0.23	11.1		0.26	11000	C	6.8	2.6		0.94	3000	C	2.3

Sample Location	HEIS Number	Sample Date	Manganese			Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	266	C	0.21	0.07		0.01	0.56	C	0.47	9.3	C	0.79	997	C	9.4
OB A-2	J15BV3	8/8/07	297		0.20	0.03		0.01	0.46	U	0.46	9.1		0.77	974	C	9.2
OB A-3	J15BV4	8/8/07	298		0.21	0.05		0.01	0.48	U	0.48	10.1		0.81	1120	C	9.5
OB A-4	J15FF5	8/21/07	270	C	0.21	0.03		0.02	0.47	U	0.47	10.4	C	0.80	1090	C	9.5
SZ A-1	J15BV6	8/9/07	251		0.21	0.02		0.02	0.47	U	0.47	9.8		0.80	912	C	9.5
SZ A-2	J15BV7	8/9/07	291		0.20	0.01	U	0.01	0.46	U	0.46	10.0		0.77	1060	C	9.2
SZ A-3	J15BV8	8/9/07	228		0.21	0.01	U	0.01	0.51		0.48	9.5		0.81	815	C	9.5
SZ A-3 Dup	J15BV9	8/9/07	118		0.20	0.01	U	0.01	0.46	U	0.46	4.2		0.78	364	C	9.3
SZ A-3 Split	J15BW2	8/9/07	246		0.08	0.01	U	0.01	1.8	U	1.80	9.0		2.30	1090		151
SZ A-4	J15BW0	8/9/07	200		0.20	0.01	U	0.01	0.46	U	0.46	8.1		0.77	700	C	9.2

Table C-2. 100-F-26:14 Inorganic Data Results. (2 Pages)

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	1.3	U	1.3	3710		2.5	0.26	U	0.26	224	C	2.1	34.6		0.24
OB A-2	J15BV3	8/8/07	1.2	U	1.2	1190	C	2.5	0.26	U	0.26	126	C	2.0	36.9		0.23
OB A-3	J15BV4	8/8/07	1.3	U	1.3	824	C	2.6	0.27	U	0.27	155	C	2.1	42.4		0.24
OB A-4	J15FF5	8/21/07	1.3	U	1.3	2490		2.5	0.27	U	0.27	227	C	2.1	36.1		0.24
SZ A-1	J15BV6	8/9/07	1.3	U	1.3	578	CJ	2.5	0.27	U	0.27	211	C	2.1	39.7	CJ	0.24
SZ A-2	J15BV7	8/9/07	1.2	U	1.2	880	CJ	2.5	0.26	U	0.26	170	C	2.0	40.2	CJ	0.23
SZ A-3	J15BV8	8/9/07	1.3	U	1.3	1610	CJ	2.6	0.27	U	0.27	481	C	2.1	34.2	CJ	0.24
SZ A-3 Dup	J15BV9	8/9/07	1.2	U	1.2	923	CJ	2.5	0.26	U	0.26	90.6	C	2.0	15.8	CJ	0.23
SZ A-3 Split	J15BW2	8/9/07	0.9	U	0.9	412		18.1	0.73	U	0.73	157		12.0	37.1		1.10
SZ A-4	J15BW0	8/9/07	1.2	U	1.2	932	CJ	2.5	0.26	U	0.26	130	C	2.0	25.1	CJ	0.23

Sample Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	38.9	C	0.12
OB A-2	J15BV3	8/8/07	33.3	C	0.11
OB A-3	J15BV4	8/8/07	38.2	C	0.12
OB A-4	J15FF5	8/21/07	36.0	C	0.12
SZ A-1	J15BV6	8/9/07	35.3	C	0.12
SZ A-2	J15BV7	8/9/07	35.9	C	0.11
SZ A-3	J15BV8	8/9/07	29.1	C	0.12
SZ A-3 Dup	J15BV9	8/9/07	16.6	C	0.12
SZ A-3 Split	J15BW2	8/9/07	37.5		3.00
SZ A-4	J15BW0	8/9/07	27.7	C	0.11

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

B = estimated result
C = blank contamination
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX D

CALCULATION BRIEFS

APPENDIX D

CALCULATION BRIEFS

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. These calculations have 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:

100-F-26:14 Shallow Zone and Overburden Sampling Plan, Calculation No. 0100F-CA-V0309, Rev. 0.

100-F-26:14 Pipeline Shallow Zone Variance Calculation, Calculation No. 0100F-CA-V0297, Rev. 0.

100-F-26:14 Pipeline BCL Stockpile Variance Calculation, Calculation No. 0100F-CA-V0298, Rev. 0.

100-F-26:14 Pipelines Cleanup Verification 95% UCL Calculation, Calculation No. 0100F-CA-V0305, Rev. 1

100-F-26:14 Pipelines Hazard Quotient and Carcinogenic Risk Calculations, Calculation No. 0100F-CA-V0311, Rev. 0.

100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief, Calculation No. 0100F-CA-V0312, Rev. 0.

DISCLAIMER FOR CALCULATIONS

The calculation that is provided in this appendix has been generated to document compliance with established cleanup levels. This calculation should be used in conjunction with other relevant documents in the administrative record.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-F-26:14 Pipeline Sample Design **Job No. 14655**

Area: 100-F

Discipline: Environmental Engineering *Calculation No: 0100F-CA-V0309

Subject: Shallow Zone and Overburden Sampling Plan

Computer Program: Excel, Autodesk World, and Autodesk Land Map Program No: Excel 2003, World R2, and Land Map 2004

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	Total = 7 Shts	G. Cruz 9-26-07	C.A. Bentz 9/27/07	N/A	S.W. Callison	10-2-07

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 G. Cruz **Date** 9/26/2007 **Calc. No.** 0100F-CA-V0309 **Rev. No.** 0

Project 100-F-26:14 Pipeline Sample Design **Job No.** 14655 **Checked** CAB **Date** 9/27/07

Subject Shallow Zone and Overburden Sampling Plan **Sheet No.** 1 of 2

1	**Problem:**	Calculate and display required sampling nodes in concurrence with 100 Area									
2		SAP DOE/RL-96-22 Rev. 4 for verification and closure.									
3											
4	**Given:**	-SAP (DOE/RL-96-22 Rev. 4) and IG (0100X-IG-G0001 Rev. 5) requirements									
5		-Shallow Sampling Area (Surface area of each zone determined from Autodesk Land Map program,									
6		Attachment 3, Sht 1 of 2, CAD file 1F:092707A, 100-F-26:14 Pipeline Shallow Zone Sampling Plan)									
7											
8		-Overburden Sampling Area (Surface area of each zone determined from Autodesk Land Map program,									
9		Attachment 3, Sht 2 of 2, CAD file 1F:092707B, 100-F-26:14 Pipeline Overburden Sampling Plan)									
10											
11											
12											
13	**Sample Design Approach**										
14	Shallow Zone	-Develop a 16 node sampling grid for the sampling area									
15		-Use appendix A of the IG to determine which six of the sixteen will be sampled									
16		to collect variance and clean up verification samples									
17											
18	Overburden:	-Develop a 16 node sampling grid for the sampling area									
19		-Use appendix A of the IG to determine which six of the sixteen will be sampled									
20		to collect variance and clean up verification samples									
21											
22	Deep Zone:	-Develop a 16 node sampling grid for the sampling area									
23		-Use appendix A of the IG to determine which four of the sixteen will be sampled									
24		to collect variance/verification samples									
25											
26	**Determination of Shallow Zone Sampling Grid:**										
27											
28	Shallow Zone Sampling Grid Area determined from Table 5-1, IG										
29	Attachment 2, Number of Decision Subunits Based on Area (Converted to Sq Meters)										
30											
31	Total Area:						655.06	m^2			
32	Area of Decision Subunits (total area 1 subunit)						655.06	m^2			
33											
34	Decision Subunit divided into 4 Sampling Areas:						163.76	m^2			
35											
36	Sampling Areas divided into a 16 node grid (node numbers 1-16):						10.23	m^2			
37											
38	Nodes to be Sampled (as determined from Attachment 1, Table A-1, Sample Grid Point Lookup Table)										
39		See Attachment 3, Sht 1 of 2, 100-F-26:14 Pipeline Shallow Zone Sampling Plan,									
40		for Sample Location Table									
41											
42											
43											
44											
45											
46											

Washington Closure Hanford **CALCULATION SHEET**

Originator G. Cruz Date 9/26/2007 Calc. No. 0100F-CA-V0309 Rev. No. 0

Project 100-F-26:14 Pipeline Sample Design Job No. 14655 Checked CAB Date 9/27/07

Subject Shallow Zone and Overburden Sampling Plan Sheet No. 2 of 2

1											
2											
3	**Determination of Overburden Sampling Grid:**										
4											
5	Overburden Sampling Grid Area determined from Table 5-1, IG										
6	Attachment 2, Number of Decision Subunits Based on Area (Converted to Sq Meters)										
7											
8	Total Area:						788.82	m^2			
9	Area of Decision Subunits (total area 1 subunit)						788.82	m^2			
10											
11	Decision Subunits divided into 4 Sampling Areas:						197.21	m^2			
12											
13	Sampling Areas divided into a 16 node grid (node numbers 1-16):						12.33	m^2			
14											
15	Nodes to be Sampled (as determined from Attachment 1, Table A-1, Sample Grid Point Lookup Table)										
16		See Attachment 3, Sht 2 of 2, 100-F-26:14 Pipeline Overburden Sampling Plan,									
17		for Sample Location Table									
18											
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Washington Closure Hanford

Originator	G. Cruz	Date	9/26/2007	Calc. No.	0100F-CA-V0309	Rev. No.	0
Project	100-F-26:14 Pipeline Sample Design			Job No.	14655	Checked	Date 9/27/07
Subject	Shallow Zone and Overburden Sampling Plan					Sheet No	1 of 1

ATTACHMENT 1

Sample Grid Point Lookup Table.

Default Plan	Sampling Area 1	Sampling Area 2	Sampling Area 3	Sampling Area 4	Sampling Area 5	Sampling Area 6	Sampling Area 7	Sampling Area 8	Sampling Area 9	Sampling Area 10
Variance/Verification	3	6	1	4	5	1	3	3	4	16
Variance/Verification	4	7	11	3	15	15	5	13	10	10
Variance/Verification	16	3	2	7	7	10	11	4	3	14
Variance/Verification	10	15	4	12	1	13	4	8	16	4
Variance	2	14	5	9	13	12	8	2	14	8
Variance	13	10	9	13	2	16	1	12	5	3
Not Sampling	6	1	10	8	14	4	16	5	8	6
Not Sampling	1	9	13	1	10	5	12	1	1	15
Not Sampling	9	12	7	5	6	2	6	7	15	9
Not Sampling	15	16	15	14	16	6	2	15	11	1
Not Sampling	8	13	8	10	12	11	13	14	2	12
Not Sampling	5	2	3	11	4	3	9	10	7	11
Not Sampling	7	11	14	15	11	14	14	6	13	2
Not Sampling	11	4	6	2	9	7	7	11	9	7
Not Sampling	12	8	16	16	3	8	15	9	6	13
Not Sampling	14	5	12	6	8	9	10	16	12	5

** **Note:** Grid nodes for each sampling area in each waste site should be numbered consistently, e.g., begin numbering the nodes in the northwestern-most node, then number consecutively left to right.

Washington Closure Hanford

Originator G. Cruz Date 9/26/2007 Calc. No. 0100F-CA-V0309 Rev. No. 0

Project 100-F-26:14 Pipeline Sample Design Job No. 14655 Checked CAB Date 9/27/07

Subject Shallow Zone and Overburden Sampling Plan Sheet No. 1 of 1

ATTACHMENT 2

Number of Decision Subunits Based on Area.

Area of Primary Decision Unit (m2)	Number of Subunits
<1,394	1
>1,394 to <2,326	2
>2,326 to <3,256	3
>3,256 to <4,186	4
>4,186 to <9,303	2
>9,303 to <13,024	3
>13,024 to <16,745	4
>16,745 to <20,466	5
>20,466	ROUNDa (Area/3,720)
a ROUND is an integer rounding function.	

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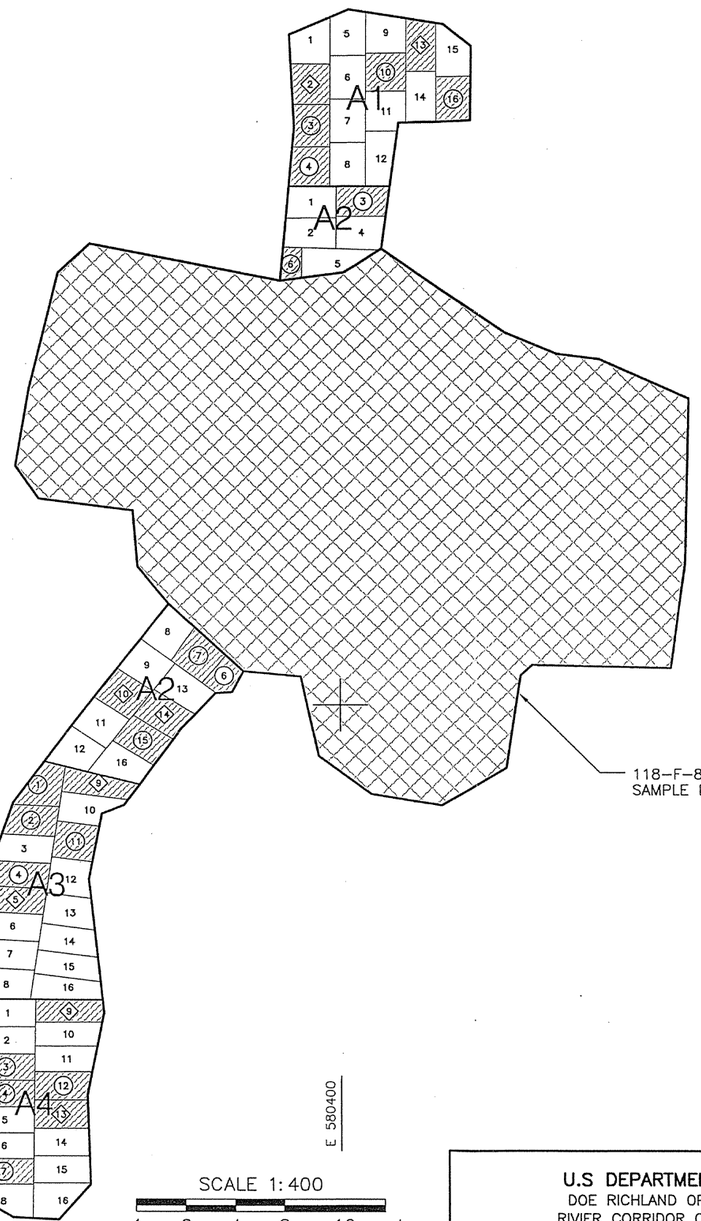


NOTES

1. SHALLOW ZONE NODE AREAS ARE APPROXIMATELY 10.23 SQUARE METERS.
2. SAMPLES ARE TAKEN FROM THE APPROXIMATE CENTER SQUARE METERS.
3. THE SHALLOW ZONE CONSISTS OF SAMPLING AREAS A1, A2, A3 AND A4 WITHIN DECISION SUBUNIT 1.

LEGEND

VARIANCE AND VERIFICATION SAMPLING NODE

VARIANCE SAMPLING NODE

SAMPLE LOCATION TABLE

DECISION SUBUNIT	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING
1	A1	S-A1-2	147601.14	580397.70
		S-A1-3	147597.75	580397.74
		S-A1-4	147594.41	580397.58
		S-A1-10	147602.15	580403.79
		S-A1-13	147604.38	580406.66
		S-A1-16	147599.96	580409.30
	A2	S-A2-3	147591.58	580401.91
		S-A2-6A	147586.41	580396.07
		S-A2-6B	147552.39	580390.57
		S-A2-7	147554.04	580388.51
		S-A2-10	147550.86	580382.47
		S-A2-14	147549.16	580385.76
		S-A2-15	147547.02	580384.01
	A3	S-A3-1	147543.30	580375.51
		S-A3-2	147540.35	580374.94
		S-A3-4	147535.83	580373.94
		S-A3-5	147533.77	580373.67
		S-A3-9	147543.47	580380.47
		S-A3-11	147538.61	580378.58
	A4	S-A4-3	147520.01	580372.89
		S-A4-4	147517.86	580372.85
		S-A4-7	147511.49	580372.74
		S-A4-9	147524.62	580376.05
		S-A4-12	147518.53	580377.59
		S-A4-13	147516.20	580377.40

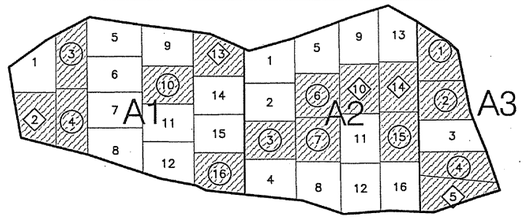
Attachment 3 Sheet No. 1 of 2
Originator G.C RUZ Date 9-26-07
Chk'd By CSB Date 9/27/07
Calc. No. 0100F-CA-V0309 Rev No. 0

ATTACHMENT 3

U.S DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVIER CORRIDOR CLOSURE CONTRACT

100-F AREA
100-F-26:14 PIPELINE
SHALLOW ZONE SAMPLING PLAN

1F:092707B.dwg



N

NOTES

1. OVERBURDEN NODE AREAS ARE APPROXIMATELY 12.33 SQUARE METERS.
2. SAMPLES ARE TAKEN FROM THE APPROXIMATE CENTER SQUARE METERS.
3. THE OVERBURDEN CONSISTS OF SAMPLING AREAS A1, A2, A3 AND A4 WITHIN DECISION SUBUNIT 1.

LEGEND

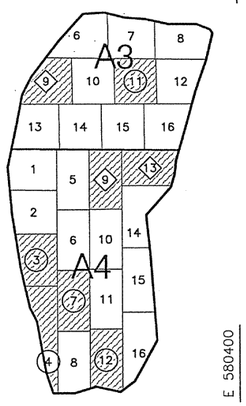
VARIANCE AND VERIFICATION SAMPLING NODE

VARIANCE SAMPLING NODE

SAMPLE LOCATION TABLE

DECISION SUBUNIT	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING
1	A1	O-A1-2	147602.57	580354.52
		O-A1-3	147607.81	580357.48
		O-A1-4	147602.40	580357.50
		O-A1-10	147605.35	580365.09
		O-A1-13	147607.84	580369.13
		O-A1-16	147598.27	580369.18
	A2	O-A2-3	147600.94	580373.20
		O-A2-6	147604.50	580376.97
		O-A2-7	147600.98	580376.99
		O-A2-10	147605.04	580380.28
		O-A2-14	147605.19	580383.39
		O-A2-15	147601.21	580383.42
	A3	O-A3-1	147608.06	580386.71
		O-A3-2	147604.12	580387.11
		O-A3-4	147598.76	580388.11
		O-A3-5	147596.43	580387.64
		O-A3-9	147541.54	580384.82
		O-A3-11	147541.53	580391.88
	A4	O-A4-3	147527.20	580383.97
		O-A4-4	147519.13	580384.86
		O-A4-7	147523.95	580386.89
		O-A4-9	147533.62	580389.45
		O-A4-12	147519.25	580389.43
		O-A4-13	147534.55	580393.02

N 147550



E 580400

SCALE 1:400

4 0 4 8 16 meters

Attachment 3 Sheet No. 2 of 2
Originator G. CRUZ Date 9-26-07
Chk'd By CAB Date 9/27/07
Calc. No. 0100F-CA-V0309 Rev No. 0

ATTACHMENT 3

U.S DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVIER CORRIDOR CLOSURE CONTRACT

100-F AREA
100-F-26:14 PIPELINE
OVERBURDEN SAMPLING PLAN

CALCULATION COVER SHEET

Project Title 100 F Area Remedial Action **Job No.** 14655

Area 100 F

Discipline Environmental ***Calc. No.** 0100F-CA-V0297

Subject **100-F-26:14 Pipeline Shallow Zone Variance Calculation**

Computer Program MS 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	3	J. R. DeBuigne JRDeB 9-25-07	R.T. Coffman RTCoffman 9/25/07	N/A	S.W. Callison SW Callison	9-25-07

SUMMARY OF REVISION

WCH-DE-018 (04/14/2006) *Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator	R. T. Coffman	Date	9/11/2007	Calc. No.	0100F-CA-V0297	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R. T. Coffman RTC	Date	9/25/07
Subject	100-F-26:14 Pipeline Shallow Zone Variance Calculation					Sheet No.	1 of 2

Conclusion:
The required number of samples calculated (1sample) for each decision sub-unit is less than the default number (4 samples) specified in the DOE/RL-96-22, Rev 4. Therefore, the default number of samples will be collected from each shallow zone decision sub-unit.

Problem:
Calculate the number of close out samples required for 100-F-26:14 Pipeline Shallow Zone Decision Unit verification sampling as required in "100 Area Remedial Action Sampling and Analysis Plan" (DOE/RL-96-22, Rev 4) and "Instruction Guide for the Remediation of 100 Areas Waste Sites" (0100X-IG-G0001, Rev 5).

Given:
1) Sample locations for the 100-F-26:14 Pipeline Shallow Zone Decision Unit are identified on the 100-F-26:14 Shallow Zone and Stockpiling Soil, Soil Debris (BCL) Sampling Plan, Calculation number 0100F-CA-V0309, Rev. 0.
2) Lookup values from DOE/RL-96-22, Rev 4.
3) Sample Design requirements from DOE/RL-96-22, Rev 4 and 0100X-IG-G0001, Rev 5.
4) Field sampling information from sampling logbook EL-1174-3.

Solution:
Calculation methodology is described in Appendix A of DOE/RL-96-22, Rev 4. Data from attached worksheets are used to calculate the required number of closeout samples. Variance calculation is based on the same three isotopes used to develop the statistical approach in DOE/RL-96-22, Rev 4. The statistical design is based on the premise that these isotopes are the predominant components of the contamination and are representative of the contamination distribution.

Sheet No.	Contents	Topic
1	Calc. Summary	Summary of Calc Brief
2	Shallow Zone	Required Number of Samples Calculation

CALCULATION SHEET

Washington Closure Hanford

Originator	R. T. Coffman	Date	9/11/2007	Calc. No.	0100F-CA-V0297	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	##RTC	Date	9/25/07
Subject	100-F-26:14 Pipeline Shallow Zone Variance Calculation				RT Coffman	Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0309.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:14 Pipeline Shallow Zone Variance Calculation
Samples values from GEA analysis
Sample Areas , A1 thru A4

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			**1.4**		**6.2**		**3.3**	
J15BP7	8/7/2007	S-A1-2	0.055	U	0.086		0.152	U
J15BP8	8/7/2007	S-A1-3	0.053	U	0.224		0.626	
J15BP9	8/7/2007	S-A1-4	0.042	U	0.069		0.113	U
J15BR0	8/7/2007	S-A1-10	0.032	U	0.042		0.1	U
J15BR1	8/7/2007	S-A1-13	0.051	U	0.054	U	0.146	U
J15BR2	8/7/2007	S-A1-16	0.053	U	0.098		0.122	U
J15BR3	8/7/2007	S-A2-3	0.067		0.48		0.789	
J15BR4	8/7/2007	S-A2-6A	0.039	U	0.129		0.124	U
J15BR5	8/7/2007	S-A2-6B	0.076	U	0.202		0.18	U
J15BR6	8/7/2007	S-A2-7	0.06	U	0.073		0.16	U
J15BR7	8/7/2007	S-A2-10	0.067	U	0.069	U	0.159	U
J15BR8	8/7/2007	S-A2-14	0.044	U	0.046	U	0.114	U
J15BR9	8/7/2007	S-A2-15	0.05	U	0.066	U	0.122	U
J15BT0	8/7/2007	S-A3-1	0.041	U	0.17		0.106	U
J15BT1	8/7/2007	S-A3-2	0.046	U	0.047	U	0.13	U
J15BT2	8/7/2007	S-A3-4	0.05	U	0.063	U	0.139	U
J15BT3	8/7/2007	S-A3-5	0.053	U	0.05	U	0.123	U
J15BT4	8/7/2007	S-A3-9	0.044	U	0.122		0.122	U
J15BT5	8/7/2007	S-A3-11	0.037	U	0.078		0.113	U
J15BT6	8/7/2007	S-A4-3	0.061	U	0.08		0.161	U
J15BT7	8/7/2007	S-A4-4	0.079	U	0.076	U	0.156	U
J15BT8	8/7/2007	S-A4-7	0.108		0.184		0.13	U
J15BT9	8/7/2007	S-A4-9	0.045	U	0.049	U	0.1	U
J15BV0	8/7/2007	S-A4-12	0.041	U	0.071	U	0.1	U
J15BW3	8/7/2007	S-A4-13	0.053	U	0.13		0.145	U
Mean (LV) ==========>			0.05		0.11		0.18	
Standard Deviation (S) ==========>			0.02		0.09		0.16	
α (5%) ==========>			1.645		1.645		1.645	
β (20%) ==========>			0.842		0.842		0.842	
Number of Samples ==========>			**1**		**1**		**1**	

CALCULATION COVER SHEET

Project Title 100 F Area Remedial Action **Job No.** 14655

Area 100 F

Discipline Environmental ***Calc. No.** 0100F-CA-V0298

Subject **100-F-26:14 Pipeline BCL Stockpile Variance Calculation**

Computer Program MS 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	3	J. R. DeBuigne 9-25-07	R.T. Coffman 9/25/07	N/A	S.W. Callison	9-25-07

SUMMARY OF REVISION

WCH-DE-018 (04/14/2006) *Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator	R. T. Coffman	Date	9/11/2007	Calc. No.	0100F-CA-V0298	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	R. T. Coffman RTC	Date	9/25/07
Subject	100-F-26:14 Pipeline BCL Stockpile Variance Calculation					Sheet No.	1 of 2

Conclusion:

The required number of samples calculated (1sample) for each decision sub-unit is less than the default number (4 samples) specified in the DOE/RL-96-22, Rev 4. Therefore, the default number of samples will be collected from each shallow zone decision sub-unit.

Problem:

Calculate the number of close out samples required for 100-F-26:14 Pipeline BCL Stockpile Decision Unit verification sampling as required in "100 Area Remedial Action Sampling and Analysis Plan" (DOE/RL-96-22, Rev 4) and "Instruction Guide for the Remediation of 100 Areas Waste Sites" (0100X-IG-G0001, Rev 5).

Given:

1) Sample locations for the 100-F-26:14 Pipeline BCL Stockpile Decision Unit are identified on the 100-F-26:14 Shallow Zone and Stockpiling Soil, Soil Debris (BCL) Sampling Plan, Calculation number 0100F-CA-V0309, Rev. 0.
2) Lookup values from DOE/RL-96-22, Rev 4.
3) Sample Design requirements from DOE/RL-96-22, Rev 4 and 0100X-IG-G0001, Rev 5.
4) Field sampling information from sampling logbook EL-1174-3.

Solution:

Calculation methodology is described in Appendix A of DOE/RL-96-22, Rev 4. Data from attached worksheets are used to calculate the required number of closeout samples. Variance calculation is based on the same three isotopes used to develop the statistical approach in DOE/RL-96-22, Rev 4. The statistical design is based on the premise that these isotopes are the predominant components of the contamination and are representative of the contamination distribution.

Sheet No.	Contents	Topic
1	Calc. Summary	Summary of Calc Brief
2	BCL Stockpile	Required Number of Samples Calculation

CALCULATION SHEET

Washington Closure Hanford

Originator	R. T. Coffman	Date	9/11/2007	Calc. No.	0100F-CA-V0298	Rev. No.	0
Project	100-F Remedial Action	Job No.	14655	Checked	## RTC	Date	9/25/07
Subject	100-F-26:14 Pipeline BCL Stockpile Variance Calculation				RT COFFMAN	Sheet No.	2 of 2

Statistical Evaluation of Analytical Data

The required number of samples resulting from the calculation is highlighted at the bottom of the page.
Each value is reflective of the specific analyte evaluated.
The highest value of the three evaluations is used to determine the required number of samples as compared against the default of four.
Sample locations are from Calculation 0100F-CA-V0309.
Mean, Standard Deviation, *t*, and Number of Samples formulas are from DOE/RL-96-22, Appendix A.

Decision Unit: 100-F-26:14 Pipeline BCL Stockpile Variance Calculation
Samples values from GEA analysis
Sample Areas , A1 thru A4

			Constituent					
Sample #	**Sample Date**	**Location**	**Cobalt-60**	Q	**Cs-137**	Q	**Europium-152**	Q
			pCi/g		pCi/g		pCi/g	
Look-up Value (HT) ==========>			1.4		6.2		3.3	
J15FF6	8/21/2007	O-A1-2	0.017	U	0.069		0.052	
J15FF7	8/21/2007	O-A1-3	0.025	U	0.136		0.099	
J15FF8	8/21/2007	O-A1-4	0.032	U	0.034		0.075	U
J15FF9	8/21/2007	O-A1-10	0.445		5.75		4.66	
J15FH0	8/21/2007	O-A1-13	0.016	U	0.142		0.136	
J15FH1	8/21/2007	O-A1-16	0.092		0.412		0.437	
J15BM9	8/2/2007	O-A2-3	0.098	U	0.355		0.468	
J15BN0	8/2/2007	O-A2-6	0.07	U	0.584		0.504	
J15BN1	8/2/2007	O-A2-7	0.052	U	0.202		0.343	
J15BN2	8/2/2007	O-A2-10	0.044	U	0.198		0.135	U
J15BN3	8/2/2007	O-A2-14	0.058	U	0.058	U	0.144	U
J15BN4	8/2/2007	O-A2-15	0.098	U	0.384		0.249	U
J15BN5	8/2/2007	O-A3-1	0.059	U	0.092		0.168	U
J15BN6	8/2/2007	O-A3-2	0.055		0.54		0.502	
J15BN7	8/2/2007	O-A3-4	0.06	U	0.238		0.237	
J15BN8	8/2/2007	O-A3-5	0.057	U	0.107		0.131	U
J15BN9	8/2/2007	O-A3-9	0.078	U	0.091		0.186	U
J15BP0	8/2/2007	O-A3-11	0.063	U	0.117		0.143	U
J15FH2	8/21/2007	O-A4-3	0.025	U	0.146		0.062	U
J15FH3	8/21/2007	O-A4-4	0.308		0.219		0.051	U
J15FH4	8/21/2007	O-A4-7	0.03	U	0.106		0.091	U
J15FH5	8/21/2007	O-A4-9	0.037	U	0.036		0.099	U
J15FH6	8/21/2007	O-A4-12	0.055	U	0.136		0.234	U
J15FH7	8/21/2007	O-A4-13	0.035	U	0.047		0.088	U
Mean (LV) ==========>			0.08		0.42		0.39	
Standard Deviation (S) ==========>			0.10		1.14		0.92	
α (5%) ==========>			1.645		1.645		1.645	
β (20%) ==========>			0.842		0.842		0.842	
Number of Samples ==========>			1		1		1	

100-F-26_14 Pipe BCL

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0305

Subject: 100-F-26:14 116-F5 Influent Pipelines 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	Total = 15	L. D. Habel	J. M. Capron	N/A	S. W. Callison	
1	Total = 15	L. D. Habel	J. M. Capron	N/A	S. W. Callison	11-6-07
			by E-W. Clark		SW Callison	

SUMMARY OF REVISION

1	Added flags from third party validation to data. Affected page 7 and attachment1 pages 2 and 3.

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

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel Date 10/01/07 Calc. No. 0100F-CA-V0305 Rev. No. 0
Project 100-F Field Remediation Job No. 14655 Checked J. M. Capron Date 10/01/07
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation by S.W. Clark Sheet No. 1 of 11

Summary

Purpose:
Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the shallow zone excavation of the subject site. Also, perform the Washington Administrative Code (WAC) 173-340-740(7)(e) 3-part test for nonradionuclide contaminants of concern (COCs) and contaminants of potential concern (COPCs) and calculate the relative percent difference (RPD) for primary-duplicate sample pairs, as necessary.

Table of Contents:

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

Solution:
Calculation methodology is described in Ecology publication #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2005b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, the WAC 173-340-740(7)(e) 3-part test for nonradionuclides, and the RPD calculations for primary-duplicate sample pairs, as required. 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 data from soil verification samples from the subject waste site. The data were entered into an EXCEL 2003 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2005b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH Date 10/02/07 Calc. No. 0100F-CA-V0305 Rev. No. 0 10/02
Project 100-F Field Remediation Job No. 14655 Checked J. M. Capron Date ~~10/02/07~~
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation by S. W. Clark Sheet No. 2 of 11

Summary (continued)

UCL Methodology:

For nonradioactive analytes with ≤50% of the data below detection limits and all detected radionuclide analytes, 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, the maximum detected value for the data set is used instead of the 95% UCL. The 95% UCL is also not calculated for data sets with no reported detections.

Calculated cleanup levels are not available in Ecology (2005) under WAC 173-340-740(3) for:

aluminum, calcium, iron, magnesium, potassium, silicon, and sodium;

therefore, these constituents are not considered site COPCs and are also not included in these tables.

The 95% UCL values were not calculated for radium-226, radium-228, thorium-228, thorium-232, and potassium-40, as these isotopes are excluded from consideration as COCs based on natural occurrence and analogous site information.

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

For nonradionuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% UCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets ($n < 10$) and all radionuclide data sets, 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 and calculation of the 95% UCL is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2005b) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting input 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,
2) greater than 10% of the raw data exceed the most stringent cleanup limit for each COPC,
3) the maximum value of the raw data set exceeds two times the most stringent cleanup limit for each COPC.

The RPD values are evaluated for analytes detected in a primary-duplicate or primary-split sample pair for the purposes of data quality assessment within the CVP. 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 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 1994b). 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 exceed a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment section of the applicable CVP, as necessary.

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH Date 10/01/07 Calc. No. 0100F-CA-V0305 Rev. No. 0
Project 100-F Field Remediation Job No. 14655 Checked J. M. Capron Date 10/01/07
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation by S.W. Clark Sheet No. 3 of 11

Summary (continued)

Methodology (continued):

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. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

Results:

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

Results Summary[a] - Remediation Footprint

Analyte	Excavation Shallow Zone		OB-BCL		Units
	95% UCL[b]	Maximum Value[c]	95% UCL[b]	Maximum Value[c]	
Cesium-137	0.206	--	1.43	--	pCi/g
Cobalt-60	0.073	--	0.179	--	pCi/g
Europium-152	0.370	--	1.07	--	pCi/g
Nickel-63	--	--	7.04	--	pCi/g
Strontium-90	--	--	0.304	--	pCi/g
Antimony	0.79	--	--	--	mg/kg
Arsenic	2.8	--	2.9	--	mg/kg
Barium	101	--	90.1	--	mg/kg
Beryllium	0.21	--	--	0.21	mg/kg
Boron	11.0	--	9.2	--	mg/kg
Cadmium	--	--	0.17	--	mg/kg
Chromium	9.3	--	9.4	--	mg/kg
Hexavalent Chromium	0.38	--	--	--	mg/kg
Cobalt	6.3	--	6.5	--	mg/kg
Copper	12.6	--	14.7	--	mg/kg
Lead	5.3	--	15.1	--	mg/kg
Manganese	272	--	297	--	mg/kg
Mercury	--	0.02	0.06	--	mg/kg
Molybdenum	--	0.51	--	0.56	mg/kg
Nickel	9.9	--	10.2	--	mg/kg
Vanadium	39.6	--	40.3	--	mg/kg
Zinc	35.6	--	38.7	--	mg/kg

[a]No detections were reported in any data set for COCs/COPCs not listed in this table.
[b]For nonradionuclides, where ≤ 50% of a data set is below detection limits, the 95% UCL value is used for a given analyte.
[c]For nonradionuclides, where > 50% of a data set is below detection limits, the statistical value defaults to the maximum detected value in the data set (Attachment 1).

BCL = below cleanup levels
COC = contaminant of concern
COPC = contaminant of potential concern
ND = not detected (for all samples in the data set)
UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LH Date 10/01/07 Calc. No. 0100F-CA-V0305 Rev. No. 0
Project 100-F Field Remediation Job No. 14655 Checked J. M. Capron Date 10/01/07
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation by S. W. Clark Sheet No. 4 of 11

Summary (continued)

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

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

Because of the "yes" answers to the WAC 173-340 3-part test for barium, additional evaluation of the attainment of cleanup criteria will be performed.

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

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

Because of the "yes" answers to the WAC 173-340 3-part test for lead, additional evaluation of the attainment of cleanup criteria will be performed.

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

Analyte	Excavation Shallow Zone Duplicate Analysis[b]	Excavation Shallow Zone Split Analysis[b]
Aluminum	96%	6%
Barium	148%	104%
Boron	--	80%
Calcium	127%	42%
Chromium	--	16%
Copper	84%	16%
Iron	67%	18%
Magnesium	76%	2%
Manganese	64%	8%
Silicon	54%	118%
Vanadium	74%	8%
Zinc	55%	25%

[a]Relative percent difference evaluation was not required for analytes not included in this table.
[b]The significance of relative percent difference values are discussed within the RSVP for the subject site.
-- = analysis not required
QA/QC = quality assurance/quality control
RSVP = remaining sites verification package

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel

Project 100-F Field Remediation

Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

Date 10/01/07

Job No. 14655

Calc. No. 0100F-CA-V0305

Checked J. M. Capron

by S. W. Clark

Rev. No. 0

Date 10/01/07

Sheet No. 5 of 11

100-F-26:14 Excavation Shallow Zone Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ A-3	J15BV8	8/9/07	0.076		0.027	0.022	U	0.022	0.062	U	0.062
SZ A-3 Dup	J15BV9	8/9/07	0.085		0.035	0.036	U	0.036	0.102	U	0.102
SZ A-1	J15BV6	8/9/07	0.118		0.035	0.043	U	0.043	0.113		0.086
SZ A-2	J15BV7	8/9/07	0.263		0.044	0.055		0.043	0.525		0.105
SZ A-4	J15BW0	8/9/07	0.061		0.030	0.089		0.031	0.058	U	0.058

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g			Cobalt-60 pCi/g			Europium-152 pCi/g		
SZ A-3	J15BV8/J15BV9	8/9/07	0.081			0.015			0.041		
SZ A-1	J15BV6	8/9/07	0.118			0.022			0.113		
SZ A-2	J15BV7	8/9/07	0.263			0.055			0.525		
SZ A-4	J15BW0	8/9/07	0.061			0.089			0.029		

Statistical Computations

95% UCL based on	Cesium-137			Cobalt-60			Europium-152		
	Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.		
N	4			4			4		
% < Detection limit	0%			50%			50%		
Mean	0.131			0.045			0.177		
Standard deviation	0.091			0.034			0.235		
95% UCL on mean	0.206			0.073			0.370		
Background	NA			NA			NA		
Statistical value above background	0.206			0.073			0.370		

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

Date 10/01/07
Job No. 14655

Calc. No. 0100F-CA-V0305
Checked J. M. Capron
by S.W. Clark SWC

Rev. No. 0
Date 10/01/07
Sheet No. 6 of 11

100-F-26:14 Excavation Shallow Zone Statistical Calculations

Verification Data

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	Chromium mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
SZ A-3	J15BV8	8/9/07	1.8		1.2	216	C	0.06	0.33		0.03	31.6		1.1	8.0	C	0.30	0.28		0.20	6.0	C	0.24	13.2		0.27
SZ A-3 Dup	J15BV9	8/9/07	1.2	U	1.2	32.6	C	0.06	0.08		0.03	1.0	U	1.0	4.2	C	0.29	0.50		0.20	2.7	C	0.23	5.4		0.26
SZ A-1	J15BV6	8/9/07	2.0		1.2	55.8	C	0.06	0.20		0.03	1.1	U	1.1	9.1	C	0.30	0.32		0.20	6.0	C	0.24	12.5		0.27
SZ A-2	J15BV7	8/9/07	3.1		1.2	58.5	C	0.06	0.20		0.03	1.6		1.0	9.5	C	0.29	0.25		0.20	6.6	C	0.23	12.5		0.26
SZ A-4	J15BW0	8/9/07	2.4		1.2	49.0	C	0.06	0.16		0.03	1.3		1.0	6.9	C	0.29	0.36		0.20	5.0	C	0.23	11.1		0.26

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Chromium mg/kg	Hexavalent Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
SZ A-3	J15BV8/J15BV9	8/9/07	1.2	124	0.21	16	6.1	0.39	4.4	9.30
SZ A-1	J15BV6	8/9/07	2.0	55.8	0.20	0.55	9.1	0.32	6.0	12.5
SZ A-2	J15BV7	8/9/07	3.1	58.5	0.20	1.6	9.5	0.25	6.6	12.5
SZ A-4	J15BW0	8/9/07	2.4	49.0	0.16	1.3	6.9	0.36	5.0	11.1

Statistical Computations

95% UCL based on	Arsenic	Barium	Beryllium	Boron	Chromium	Hexavalent Chromium	Cobalt	Copper
	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonpararnetric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
N	4	4	4	4	4	4	4	4
% < Detection limit	0%	0%	0%	25%	0%	0%	0%	0%
Mean	2.2	71.9	0.19	4.9	7.9	0.33	5.5	11.4
Standard deviation	0.79	35.2	0.021	7.5	1.7	0.061	1.0	1.5
95% UCL on mean	2.8	101	0.21	11	9.3	0.38	6.3	12.6
Maximum value	3.1	216	0.33	31.6	9.5	0.50	6.6	13.2
Final Statistical Value	2.8	101	0.21	11	9.3	0.38	6.3	12.6
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 Direct Exposure, GW & River Protection	132 GW Protection	1.51 GW & River Protection	320 GW Protection	18.5 GW & River Protection	2 River Protection	32 GW Protection	22.0 River Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	YES	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
WAC 173-340 Compliance? Further Assessment Required	Yes	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to direct exposure cleanup levels.	Yes	Yes	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH
Project 100-F Field Remediation
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

Date 10/29/07
Job No. 14655

Calc. No. 0100F-CA-V0305
Checked J. M. Capron

Rev. No. 0 1 LDH
Date 10/29/07
Sheet No. 7 of 11

100-F-26:14 Excavation Shallow Zone Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Lead			Manganese			Mercury			Nickel			Vanadium			Zinc			Antimony			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	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ A-3	J15BV8	8/9/07	4.1		0.98	228		0.21	0.01	U	0.01	9.5		0.81	34.2	CJ	0.24	29.1	C	0.12	0.83	J	0.66	0.51		0.48
SZ A-3 Dup	J15BV9	8/9/07	1.9		0.95	118		0.2	0.01	U	0.01	4.2		0.78	15.8	CJ	0.23	16.6	C	0.12	0.79	J	0.64	0.46	U	0.46
SZ A-1	J15BV6	8/9/07	5.9		0.98	251		0.21	0.02		0.02	9.8		0.8	39.7	CJ	0.24	35.3	C	0.12	0.65	UJ	65	0.47	U	0.47
SZ A-2	J15BV7	8/9/07	4.8		0.95	291		0.2	0.01	U	0.01	10		0.77	40.2	CJ	0.23	35.9	C	0.11	0.69	J	0.63	0.46	U	0.46
SZ A-4	J15BW0	8/9/07	2.6		0.94	200		0.2	0.01	U	0.01	8.1		0.77	25.1	CJ	0.23	27.7	C	0.11	0.63	UJ	0.63	0.46	U	0.46

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Lead mg/kg	Manganese mg/kg	Mercury mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg	Antimony mg/kg	Molybdenum mg/kg
SZ A-3	J15BV8/J15BV9	8/9/07	3.0	173	0.005	6.9	25.0	22.9	0.81	0.37
SZ A-1	J15BV6	8/9/07	5.9	251	0.02	9.8	39.7	35.3	0.65	0.24
SZ A-2	J15BV7	8/9/07	4.8	291	0.005	10	40.2	35.9	0.69	0.23
SZ A-4	J15BW0	8/9/07	2.6	200	0.005	8.1	25.1	27.7	0.32	0.23

Statistical Computations

95% UCL based on	Lead	Manganese	Mercury	Nickel	Vanadium	Zinc	Antimony	Molybdenum
	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
N	4	4	4	4	4	4	4	4
% < Detection limit	0%	0%	75%	0%	0%	0%	50%	75%
Mean	4.1	229	0.01	8.7	32.5	30.4	0.62	0.27
Standard deviation	1.5	52.6	0.01	1.5	8.61	6.29	0.21	0.07
95% UCL on mean	5.3	272	0.01	9.9	39.6	35.6	0.79	0.32
Maximum value	5.9	291	0.02	10	40.2	35.9	0.83	0.51
Final Statistical Value	5.3	272	0.02	9.9	39.6	35.6	0.79	0.51
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection	19.1 River Protection	85.1 GW Protection	67.8 River Protection	5 GW & River Protection	8 GW Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
WAC 173-340 Compliance? Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel
Project 100-F Field Remediation
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

Date 10/01/07
Job No. 14655

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Checked J. M. Capron
by S. W. Clark 10/2/07

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Date 10/01/07
Sheet No. 8 of 11

100-F-26:14 Overburden/BCL Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Q	MDA	Cobalt-60 pCi/g	Q	MDA	Europium-152 pCi/g	Q	MDA	Nickel-63 pCi/g	Q	MDA	Strontium-90 pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	1.96		0.076	0.252		0.074	1.36		0.185	9.62		3.19	0.373		0.214
OB A-2	J15BV3	8/8/07	0.521		0.027	0.043		0.021	0.527		0.058	1.97	U	3.25	0.153	U	0.246
OB A-3	J15BV4	8/8/07	0.410		0.042	0.040	U	0.040	0.576		0.091	1.26	U	3.33	0.186		0.179
OB A-4	J15FF5	8/21/07	0.090		0.083	0.087	U	0.087	0.210	U	0.210	2.50	U	3.24	0.006	U	0.226

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g			Cobalt-60 pCi/g			Europium-152 pCi/g			Nickel-63 pCi/g			Strontium-90 pCi/g		
OB A-1	J15FF4	8/21/07	1.96			0.252			1.36			9.62			0.373		
OB A-2	J15BV3	8/8/07	0.521			0.043			0.527			1.97			0.153		
OB A-3	J15BV4	8/8/07	0.410			0.020			0.576			1.26			0.186		
OB A-4	J15FF5	8/21/07	0.090			0.044			0.105			2.50			0.006		

Statistical Computations

95% UCL based on	Cesium-137			Cobalt-60			Europium-152			Nickel-63			Strontium-90		
	Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.			Radionuclide data set. Use nonparametric z-stat.		
N	4			4			4			4			4		
% < Detection limit	0%			50%			25%			75%			50%		
Mean	0.745			0.090			0.642			3.84			0.180		
Standard deviation	0.830			0.109			0.523			3.89			0.151		
95% UCL on mean	1.43			0.179			1.07			7.04			0.304		
Background	NA			NA			NA			NA			NA		
Statistical value above background	1.43			0.179			1.07			7.04			0.304		

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel
Project 100-F Field Remediation
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

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Sheet No. 9 of 11

100-F-26:14 Overburden/BCL Statistical Calculations

Verification Data

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
OB A-1	J15FF4	8/21/07	3.1		1.2	56.5	C	0.06	0.03	U	0.03	1.2	C	1.1	0.15	U	0.15	7.6	C	0.29	5.6		0.24	12.2		0.26
OB A-2	J15BV3	8/8/07	2.5		1.2	61.7	C	0.06	0.03	U	0.03	1.0	U	1.0	0.16		0.14	7.5	C	0.29	6.2		0.23	12.6	C	0.26
OB A-3	J15BV4	8/8/07	2.6		1.2	63.5	C	0.06	0.03	U	0.03	1.1	U	1.1	0.19		0.15	9.2	C	0.30	6.8		0.24	13.9	C	0.27
OB A-4	J15FF5	8/21/07	2.5		1.2	105	C	0.06	0.21	C	0.03	13.5	C	1.1	0.15	U	0.15	9.7	C	0.30	5.7		0.24	15.3		0.27

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
OB A-1	J15FF4	8/21/07	3.1	56.5	0.02	1.2	0.075	7.6	5.6	12.2
OB A-2	J15BV3	8/8/07	2.5	61.7	0.02	0.50	0.16	7.5	6.2	12.6
OB A-3	J15BV4	8/8/07	2.6	63.5	0.02	0.55	0.19	9.2	6.8	13.9
OB A-4	J15FF5	8/21/07	2.5	105	0.21	13.5	0.075	9.7	5.7	15.3

Statistical Computations

95% UCL based on	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
N	4	4	4	4	4	4	4	4
% < Detection limit	0%	0%	75%	50%	50%	0%	0%	0%
Mean	2.7	71.7	0.06	3.9	0.13	8.5	6.1	13.5
Standard deviation	0.29	22.4	0.10	6.4	0.059	1.1	0.55	1.40
95% UCL on mean	2.9	90.1	0.14	9.2	0.17	9.4	6.5	14.7
Final Statistical Value	2.9	90.1	0.21	9.2	0.17	9.4	6.5	14.7
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 Direct Exposure, GW & River Protection	132 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	32 GW Protection	22.0 River Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
WAC 173-340 Compliance? Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel
Project 100-F Field Remediation
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation

Date 10/01/07
Job No. 14655

Calc. No. 0100F-CA-V0305
Checked J. M. Capron
by S. W. Clark 12/12

Rev. No. 0
Date 10/01/07
Sheet No. 10 of 11

100-F-26:14 Overburden/BCL Statistical Calculations

Verification Data

Sample Area	Sample Number	Sample Date	Lead mg/kg	Lead Q	Lead PQL	Manganese mg/kg	Manganese Q	Manganese PQL	Mercury mg/kg	Mercury Q	Mercury PQL	Nickel mg/kg	Nickel Q	Nickel PQL	Vanadium mg/kg	Vanadium Q	Vanadium PQL	Zinc mg/kg	Zinc Q	Zinc PQL	Molybdenum mg/kg	Molybdenum Q	Molybdenum PQL
OB A-1	J15FF4	8/21/07	3.7		0.97	266	C	0.21	0.07		0.01	9.3	C	0.79	34.6		0.24	38.9	C	0.12	0.56	C	0.47
OB A-2	J15BV3	8/8/07	4.2		0.95	297		0.2	0.03		0.01	9.1		0.77	36.9		0.23	33.3	C	0.11	0.46	U	0.46
OB A-3	J15BV4	8/8/07	20.4		0.98	298		0.21	0.05		0.01	10.1		0.81	42.4		0.24	38.2	C	0.12	0.48	U	0.48
OB A-4	J15FF5	8/21/07	5.9		0.98	270	C	0.21	0.03		0.02	10.4	C	0.8	36.1		0.24	36.0	C	0.12	0.47	U	0.47

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Lead mg/kg	Manganese mg/kg	Mercury mg/kg	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg	Molybdenum mg/kg
OB A-1	J15FF4	8/21/07	3.7	266	0.07	9.3	34.6	38.9	0.56
OB A-2	J15BV3	8/8/07	4.2	297	0.03	9.1	36.9	33.3	0.23
OB A-3	J15BV4	8/8/07	20.4	298	0.05	10.1	42.4	38.2	0.24
OB A-4	J15FF5	8/21/07	5.9	270	0.03	10.4	36.1	36.0	0.24

Statistical Computations

	Lead	Manganese	Mercury	Nickel	Vanadium	Zinc	Molybdenum
95% UCL based on	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.	Small data set (n<10). Use nonparametric z-statistic.
N	4	4	4	4	4	4	4
% < Detection limit	0%	0%	0%	0%	0%	0%	75%
Mean	8.6	283	0.05	9.7	37.5	36.6	0.32
Standard deviation	8.0	17.1	0.02	0.62	3.40	2.52	0.16
95% UCL on mean	15.1	297	0.06	10.2	40.3	38.7	0.45
Maximum value	20.4	298	0.07	10.4	42.4	38.9	0.56
Final Statistical Value	15.1	297	0.06	10.2	40.3	38.7	0.56
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection	19.1 River Protection	85.1 GW Protection	67.8 River Protection	8 GW Protection
WAC 173-340 3-PART TEST							
95% UCL > Cleanup Limit?	YES	NO	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	YES	NO	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO
WAC 173-340 Compliance? Further Assessment Required	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to direct exposure cleanup levels.	Yes	Yes	Yes	Yes	Yes	Yes

CALCULATION SHEET

Washington Closure Hanford

Originator L. D. Habel LDH | Date 10/01/07 | Calc. No. 0100F-CA-V0305 | Rev. No. 0
Project 100-F Field Remediation | Job No. 14655 | Checked J. M. Capron | Date
Subject 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation | by S.W. Clark | Sheet No. 11 of 11

Split/Duplicate Analysis, Excavation Shallow Zone

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Q	Cesium-137 MDA	Radium-226 pCi/g	Q	Radium-226 MDA	Radium-228 pCi/g	Q	Radium-228 MDA	Thorium-228 GEA pCi/g	Q	Thorium-228 GEA MDA	Thorium-232 GEA pCi/g	Q	Thorium-232 GEA MDA	Aluminum mg/kg	Q	Aluminum PQL	Antimony mg/kg	Q	Antimony PQL	Arsenic mg/kg	Q	Arsenic PQL
SZ A-3	J15BV8	8/9/07	0.076		0.027	0.484		0.043	0.609		0.108	0.599		0.034	0.609		0.108	6920	C	5.0	0.83		0.66	1.8		1.2
SZ A-3 Dup	J15BV9	8/9/07	0.085		0.035	0.416		0.054	0.660		0.128	0.779		0.056	0.660		0.128	2430	C	4.8	0.79		0.64	1.2	U	1.2
SZ A-3 Split	J15BW2	8/9/07	0.081		0.016													6510		5.1	1.4	B	1.0	1.8	B	0.5

Analysis:

		Cesium-137	Radium-226	Radium-228	Thorium-228 GEA	Thorium-232 GEA	Aluminum	Antimony	Arsenic
TDL		0.1	0.1	0.2	1	1	5	6	10
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No - evaluate difference
	Both >5xTDL?	No - evaluate difference	No - evaluate difference	No - evaluate difference	No - evaluate difference	No - evaluate difference	Yes (calc RPD)	No - evaluate difference	
	RPD						*96%*		
	Difference >2xTDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable
Split Analysis	Both > PQL?	Yes (continue)					Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No - evaluate difference					Yes (calc RPD)	No - evaluate difference	No - evaluate difference
	RPD						6.1%		
	Difference >2xTDL?	No - acceptable					Not applicable	No - acceptable	No - acceptable

Split/Duplicate Analysis, Excavation Shallow Zone (continued)

Sample Area	Sample Number	Sample Date	Barium mg/kg	Q	Barium PQL	Beryllium mg/kg	Q	Beryllium PQL	Boron mg/kg	Q	Boron PQL	Chromium mg/kg	Q	Chromium PQL	Cobalt mg/kg	Q	Cobalt PQL	Copper mg/kg	Q	Copper PQL	Iron mg/kg	Q	Iron PQL	Lead mg/kg	Q	Lead PQL
SZ A-3	J15BV8	8/9/07	216	C	0.06	0.33		0.03	31.6		1.1	8.0	C	0.30	6.0	C	0.24	13.2		0.27	13000	C	7.1	4.1		0.98
SZ A-3 Dup	J15BV9	8/9/07	32.6	C	0.06	0.08		0.03	1.0	U	1.0	4.2	C	0.23	2.7	C	0.23	5.4		0.26	6500	C	6.9	1.9		0.95
SZ A-3 Split	J15BW2	8/9/07	67.9		0.46	0.25	B	0.14	13.6	B	3.0	9.4		0.45	7.4	B	0.46	11.3		0.80	15600		7.5	5.8		0.60

Analysis:

		Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Iron	Lead
TDL		2	0.5	2	1	2	1	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No - evaluate difference	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No - evaluate difference		No - evaluate difference	No - evaluate difference	Yes (calc RPD)	Yes (calc RPD)	No - evaluate difference
	RPD	*148%*					*84%*	*66.7%*	
	Difference >2xTDL?	Not applicable	No - acceptable	*Yes - assess further*	*Yes - assess further*	No - acceptable	Not applicable	Not applicable	No - acceptable
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 - evaluate difference	Yes (calc RPD)	Yes (calc RPD)	No - evaluate difference	Yes (calc RPD)	Yes (calc RPD)	No - evaluate difference
	RPD	*104%*		*80%*	16%		16%	18.2%	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Split/Duplicate Analysis, Excavation Shallow Zone (continued)

Sample Area	Sample Number	Sample Date	Magnesium mg/kg	Q	Magnesium PQL	Manganese mg/kg	Q	Manganese PQL	Molybdenum mg/kg	Q	Molybdenum PQL	Nickel mg/kg	Q	Nickel PQL	Potassium mg/kg	Q	Potassium PQL	Silicon mg/kg	Q	Silicon PQL	Sodium mg/kg	Q	Sodium PQL	Vanadium mg/kg	Q	Vanadium PQL
SZ A-3	J15BV8	8/9/07	3820	C	2.4	228		0.21	0.51		0.48	9.5		0.81	815	C	9.5	1610	C	2.6	481	C	2.1	34.2	C	0.24
SZ A-3 Dup	J15BV9	8/9/07	1720	C	2.3	118		0.20	0.46	U	0.46	4.2		0.78	364	C	9.3	923	C	2.5	90.6	C	2.0	15.8	C	0.23
SZ A-3 Split	J15BW2	8/9/07	3760		18	246		0.08	1.8	U	1.80	9.0		2.30	1090		151	412		18.1	157		12.0	37.1		1.10

Analysis:

		Magnesium	Manganese	Molybdenum	Nickel	Potassium	Silicon	Sodium	Vanadium
TDL		75	5	5	4	400	2	50	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No - evaluate difference	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		No - evaluate difference	No - evaluate difference	Yes (calc RPD)	No - evaluate difference	Yes (calc RPD)
	RPD	*76%*	*64%*				*54%*		*74%*
	Difference >2xTDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	*Yes - assess further*	Not applicable
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No - evaluate difference	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		No - evaluate difference	No - evaluate difference	Yes (calc RPD)	No - evaluate difference	Yes (calc RPD)
	RPD	1.6%	7.6%				*118%*		8.1%
	Difference >2xTDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	*Yes - assess further*	Not applicable

Split/Duplicate Analysis, Excavation Shallow Zone (continued)

Sample Area	Sample Number	Sample Date	Zinc mg/kg	Q	Zinc PQL	Hexavalent Chromium mg/kg	Q	Hexavalent Chromium PQL	Calcium mg/kg	Q	Calcium PQL	Potassium-40 pCi/g	Q	Potassium-40 MDA
SZ A-3	J15BV8	8/9/07	29.1	C	0.12	0.28		0.20	7630	C	2.1	13.4		0.245
SZ A-3 Dup	J15BV9	8/9/07	16.6	C	0.12	0.50		0.20	1690	C	2.1	13.4		0.369
SZ A-3 Split	J15BW2	8/9/07	37.5		3.00	0.35	U	0.35	4970		60.2			

Analysis:

		Zinc	Hexavalent Chromium	Calcium	Potassium-40
TDL		1	1	100	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No - evaluate difference	Yes (calc RPD)	Yes (calc RPD)
	RPD	*55%*		*127%*	0%
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	Not applicable
Split Analysis	Both > PQL?	Yes (continue)	No - evaluate difference	Yes (continue)	
	Both >5xTDL?	Yes (calc RPD)		Yes (calc RPD)	
	RPD	25%		*42%*	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Americium-241 GEA			Barium-133			Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.263	U	0.263	0.085	U	0.085	1.96		0.076	0.252		0.074	1.36		0.185
OB A-2	J15BV3	8/8/07	0.143	U	0.143	0.029	U	0.029	0.521		0.027	0.043		0.021	0.527		0.058
OB A-3	J15BV4	8/8/07	0.133	U	0.133	0.060	U	0.060	0.410		0.042	0.040	U	0.040	0.576		0.091
OB A-4	J15FF5	8/21/07	0.073	U	0.073	0.082	U	0.082	0.090		0.083	0.087	U	0.087	0.210	U	0.210
SZ A-1	J15BV6	8/9/07	0.277	U	0.277	0.041	U	0.041	0.118		0.035	0.043	U	0.043	0.113		0.086
SZ A-2	J15BV7	8/9/07	0.307	U	0.307	0.044	U	0.044	0.263		0.044	0.055		0.043	0.525		0.105
SZ A-3	J15BV8	8/9/07	0.145	U	0.145	0.029	U	0.029	0.076		0.027	0.022	U	0.022	0.062	U	0.062
SZ A-3 Dup	J15BV9	8/9/07	0.120	U	0.120	0.055	U	0.055	0.085		0.035	0.036	U	0.036	0.102	U	0.102
SZ A-3 Split	J15BW2	8/9/07				-0.004	U	0.014	0.081		0.016	0.008	U	0.016	0.012	U	0.036
SZ A-4	J15BW0	8/9/07	0.043	U	0.043	0.027	U	0.027	0.061		0.030	0.089		0.031	0.058	U	0.058

Sample Location	HEIS Number	Sample Date	Europium-154			Europium-155			Nickel-63			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.247	U	0.247	0.174	U	0.174	9.62		3.19	12.1		0.720	0.405		0.157
OB A-2	J15BV3	8/8/07	0.076	U	0.076	0.082	U	0.082	1.97	U	3.25	13.3		0.234	0.407		0.044
OB A-3	J15BV4	8/8/07	0.132	U	0.132	0.185	U	0.185	1.26	U	3.33	15.0		0.264	0.464		0.064
OB A-4	J15FF5	8/21/07	0.242	U	0.242	0.157	U	0.157	2.50	U	3.24	6.34		0.700	0.246		0.150
SZ A-1	J15BV6	8/9/07	0.124	U	0.124	0.103	U	0.103	0.128	U	3.60	14.4		0.332	0.413		0.074
SZ A-2	J15BV7	8/9/07	0.135	U	0.135	0.117	U	0.117	3.24	U	3.50	13.3		0.360	0.433		0.085
SZ A-3	J15BV8	8/9/07	0.075	U	0.075	0.083	U	0.083	-0.310	U	3.73	13.4		0.245	0.484		0.043
SZ A-3 Dup	J15BV9	8/9/07	0.127	U	0.127	0.094	U	0.094	-0.286	U	3.44	13.4		0.369	0.416		0.054
SZ A-3 Split	J15BW2	8/9/07	0.010	U	0.052	0.014	U	0.039	-0.293	U	6.28						
SZ A-4	J15BW0	8/9/07	0.077	U	0.077	0.064	U	0.064	1.45	U	3.38	14.6		0.199	0.414		0.043

Sample Location	HEIS Number	Sample Date	Radium-228			Silver-108 metastable			Thorium-228 GEA			Thorium-232 GEA			Strontium-90		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.980	U	0.980	0.063	U	0.063	0.325		0.145	0.980	U	0.980	0.373		0.214
OB A-2	J15BV3	8/8/07	0.594		0.098	0.018	U	0.018	0.625		0.032	0.594		0.098	0.153	U	0.246
OB A-3	J15BV4	8/8/07	0.832		0.160	0.031	U	0.031	0.942		0.084	0.832		0.160	0.186		0.179
OB A-4	J15FF5	8/21/07	0.292		0.266	0.056	U	0.056	0.431		0.101	0.292		0.266	0.006	U	0.226
SZ A-1	J15BV6	8/9/07	0.753		0.146	0.026	U	0.026	0.619		0.046	0.753		0.146	-0.005	U	0.200
SZ A-2	J15BV7	8/9/07	0.590		0.176	0.030	U	0.030	0.645		0.054	0.590		0.176	0.148	U	0.263
SZ A-3	J15BV8	8/9/07	0.609		0.108	0.017	U	0.017	0.599		0.034	0.609		0.108	-0.097	U	0.302
SZ A-3 Dup	J15BV9	8/9/07	0.660		0.128	0.027	U	0.027	0.779		0.056	0.660		0.128	0.019	U	0.220
SZ A-3 Split	J15BW2	8/9/07				-0.003	U	0.011							-0.021	U	0.154
SZ A-4	J15BW0	8/9/07	0.708		0.092	0.018	U	0.018	0.646		0.028	0.708		0.092	0.006	U	0.269

Sample Location	HEIS Number	Sample Date	Uranium-235 GEA			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA
OB A-1	J15FF4	8/21/07	0.270	U	0.270	9.43	U	9.43
OB A-2	J15BV3	8/8/07	0.109	U	0.109	2.83	U	2.83
OB A-3	J15BV4	8/8/07	0.186	U	0.186	4.66	U	4.66
OB A-4	J15FF5	8/21/07	0.270	U	0.270	9.14	U	9.14
SZ A-1	J15BV6	8/9/07	0.149	U	0.149	4.01	U	4.01
SZ A-2	J15BV7	8/9/07	0.169	U	0.169	4.53	U	4.53
SZ A-3	J15BV8	8/9/07	0.162	U	0.162	2.80	U	2.80
SZ A-3 Dup	J15BV9	8/9/07	0.148	U	0.148	4.36	U	4.36
SZ A-3 Split	J15BW2	8/9/07						
SZ A-4	J15BW0	8/9/07	0.105	U	0.105	2.90	U	2.90

Note: Data qualified with B, C, D and/or J, are considered acceptable values.
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment	1	Sheet No.	1 of 3
Originator	L. D. Habel	Date	10/01/07
Checked	J. M. Capron	Date	10/02/07
Calc. No.	0100F-CA-V0305	Rev. No.	0

for S.W. Clark

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	5460	C	4.9	0.65	U	0.65	3.1		1.2	56.5	C	0.06	0.03	U	0.03
OB A-2	J15BV3	8/8/07	4960		4.8	0.63	U	0.63	2.5		1.2	61.7	C	0.06	0.03	U	0.03
OB A-3	J15BV4	8/8/07	6100		5.0	0.66	U	0.66	2.6		1.2	63.5	C	0.06	0.03	U	0.03
OB A-4	J15FF5	8/21/07	6750	C	4.9	0.65	U	0.65	2.5		1.2	105	C	0.06	0.21	C	0.03
SZ A-1	J15BV6	8/9/07	5740	C	4.9	0.65	UJ	0.65	2.0		1.2	55.8	C	0.06	0.20		0.03
SZ A-2	J15BV7	8/9/07	5850	C	4.8	0.69	J	0.63	3.1		1.2	58.5	C	0.06	0.20		0.03
SZ A-3	J15BV8	8/9/07	6920	C	5.0	0.83	J	0.66	1.8		1.2	216	C	0.06	0.33		0.03
SZ A-3 Dup	J15BV9	8/9/07	2430	C	4.8	0.79	J	0.64	1.2	U	1.2	32.6	C	0.06	0.08		0.03
SZ A-3 Split	J15BW2	8/9/07	6510		5.1	1.4	B	1.0	1.8	B	0.5	67.9		0.46	0.25	B	0.14
SZ A-4	J15BW0	8/9/07	4310	C	4.8	0.63	UJ	0.63	2.4		1.2	49.0	C	0.06	0.16		0.03

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium (total)			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	1.2	C	1.1	0.15	U	0.15	5250		2.1	7.6	C	0.29	0.21	U	0.20
OB A-2	J15BV3	8/8/07	1.0	U	1.0	0.16		0.14	4060	C	2.0	7.5	C	0.29	0.20	U	0.20
OB A-3	J15BV4	8/8/07	1.1	U	1.1	0.19		0.15	5620	C	2.1	9.2	C	0.30	0.20	U	0.20
OB A-4	J15FF5	8/21/07	13.5	C	1.1	0.15	U	0.15	6200		2.1	9.7	C	0.30	0.20	U	0.20
SZ A-1	J15BV6	8/9/07	1.1	U	1.1	0.15	U	0.15	6260	C	2.1	9.1	C	0.30	0.32		0.20
SZ A-2	J15BV7	8/9/07	1.6		1.0	0.14	U	0.14	4230	C	2.0	9.5	C	0.29	0.25		0.20
SZ A-3	J15BV8	8/9/07	31.6		1.1	0.15	U	0.15	7630	C	2.1	8.0	C	0.30	0.28		0.20
SZ A-3 Dup	J15BV9	8/9/07	1.0	U	1.0	0.14	U	0.14	1690	C	2.1	4.2	C	0.29	0.50		0.20
SZ A-3 Split	J15BW2	8/9/07	13.6	B	3.0	0.12	U	0.12	4970		60.2	9.4		0.45	0.35	U	0.35
SZ A-4	J15BW0	8/9/07	1.3		1.0	0.14	U	0.14	3000	C	2.0	6.9	C	0.29	0.36		0.20

Sample Location	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	5.6		0.24	12.2		0.26	14100	C	7.0	3.7		0.97	3440	C	2.4
OB A-2	J15BV3	8/8/07	6.2		0.23	12.6	C	0.26	15900	C	6.9	4.2		0.95	3410	C	2.3
OB A-3	J15BV4	8/8/07	6.8		0.24	13.9	C	0.27	18100	C	7.1	20.4		0.98	4030	C	2.4
OB A-4	J15FF5	8/21/07	5.7		0.24	15.3		0.27	14400	C	7.1	5.9		0.98	3660	C	2.4
SZ A-1	J15BV6	8/9/07	6.0	C	0.24	12.5		0.27	15400	C	7.1	5.9		0.98	3670	C	2.4
SZ A-2	J15BV7	8/9/07	6.6	C	0.23	12.5		0.26	16700	C	6.8	4.8		0.95	3820	C	2.3
SZ A-3	J15BV8	8/9/07	6.0	C	0.24	13.2		0.27	13000	C	7.1	4.1		0.98	3820	C	2.4
SZ A-3 Dup	J15BV9	8/9/07	2.7	C	0.23	5.4		0.26	6500	C	6.9	1.9		0.95	1720	C	2.3
SZ A-3 Split	J15BW2	8/9/07	7.4	B	0.46	11.3		0.80	15600		7.5	5.8		0.60	3760		18
SZ A-4	J15BW0	8/9/07	5.0	C	0.23	11.1		0.26	11000	C	6.8	2.6		0.94	3000	C	2.3

Sample Location	HEIS Number	Sample Date	Manganese			Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	266	C	0.21	0.07		0.01	0.56	C	0.47	9.3	C	0.79	997	C	9.4
OB A-2	J15BV3	8/8/07	297		0.20	0.03		0.01	0.46	U	0.46	9.1		0.77	974	C	9.2
OB A-3	J15BV4	8/8/07	298		0.21	0.05		0.01	0.48	U	0.48	10.1		0.81	1120	C	9.5
OB A-4	J15FF5	8/21/07	270	C	0.21	0.03		0.02	0.47	U	0.47	10.4	C	0.80	1090	C	9.5
SZ A-1	J15BV6	8/9/07	251		0.21	0.02		0.02	0.47	U	0.47	9.8		0.80	912	C	9.5
SZ A-2	J15BV7	8/9/07	291		0.20	0.01	U	0.01	0.46	U	0.46	10.0		0.77	1060	C	9.2
SZ A-3	J15BV8	8/9/07	228		0.21	0.01	U	0.01	0.51		0.48	9.5		0.81	815	C	9.5
SZ A-3 Dup	J15BV9	8/9/07	118		0.20	0.01	U	0.01	0.46	U	0.46	4.2		0.78	364	C	9.3
SZ A-3 Split	J15BW2	8/9/07	246		0.08	0.01	U	0.01	1.8	U	1.80	9.0		2.30	1090		151
SZ A-4	J15BW0	8/9/07	200		0.20	0.01	U	0.01	0.46	U	0.46	8.1		0.77	700	C	9.2

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

B = estimated result
C = blank contamination
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment 1 Sheet No. 2 of 3 rev 1
Originator L. D. Habel Date 10/29/07
Checked J. M. Capron Date

Attachment 1. 100-F-26:14 Verification Sampling Results.

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	1.3	U	1.3	3710		2.5	0.26	U	0.26	224	C	2.1	34.6		0.24
OB A-2	J15BV3	8/8/07	1.2	U	1.2	1190	C	2.5	0.26	U	0.26	126	C	2.0	36.9		0.23
OB A-3	J15BV4	8/8/07	1.3	U	1.3	824	C	2.6	0.27	U	0.27	155	C	2.1	42.4		0.24
OB A-4	J15FF5	8/21/07	1.3	U	1.3	2490		2.5	0.27	U	0.27	227	C	2.1	36.1		0.24
SZ A-1	J15BV6	8/9/07	1.3	U	1.3	578	CJ	2.5	0.27	U	0.27	211	C	2.1	39.7	CJ	0.24
SZ A-2	J15BV7	8/9/07	1.2	U	1.2	880	CJ	2.5	0.26	U	0.26	170	C	2.0	40.2	CJ	0.23
SZ A-3	J15BV8	8/9/07	1.3	U	1.3	1610	CJ	2.6	0.27	U	0.27	481	C	2.1	34.2	CJ	0.24
SZ A-3 Dup	J15BV9	8/9/07	1.2	U	1.2	923	CJ	2.5	0.26	U	0.26	90.6	C	2.0	15.8	CJ	0.23
SZ A-3 Split	J15BW2	8/9/07	0.9	U	0.9	412		18.1	0.73	U	0.73	157		12.0	37.1		1.10
SZ A-4	J15BW0	8/9/07	1.2	U	1.2	932	CJ	2.5	0.26	U	0.26	130	C	2.0	25.1	CJ	0.23

Sample Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
OB A-1	J15FF4	8/21/07	38.9	C	0.12
OB A-2	J15BV3	8/8/07	33.3	C	0.11
OB A-3	J15BV4	8/8/07	38.2	C	0.12
OB A-4	J15FF5	8/21/07	36.0	C	0.12
SZ A-1	J15BV6	8/9/07	35.3	C	0.12
SZ A-2	J15BV7	8/9/07	35.9	C	0.11
SZ A-3	J15BV8	8/9/07	29.1	C	0.12
SZ A-3 Dup	J15BV9	8/9/07	16.6	C	0.12
SZ A-3 Split	J15BW2	8/9/07	37.5		3.00
SZ A-4	J15BW0	8/9/07	27.7	C	0.11

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

B = estimated result
C = blank contamination
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment	1	Sheet No.	3 of 3
Originator	L. D. Habel	Date	10/29/07
Checked	J. M. Capron	Date	
Calc. No.	0100F-CA-V0305	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0311

Subject: 100-F-26:14 Hazard Quotient and Carcinogenic Risk Calculations

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	Total = 4	L. D. Habel	J. M. Capron	N/A	S. W. Callison	
			by S. W. Clark		S W Callison	10-4-07
			S. W. Clark			

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:	L.D. Habel	Date:	10/3/07	Calc. No.:	0100F-CA-V0311	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	10/3/07
Subject:	100-F-26:14 Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk values for the 100-F-26:14 site remedial action. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), 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, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) EPA, 1994, *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children*, EPA/540/R-93/081, Publication No. 9285.7-15-1, U.S. Environmental Protection Agency, Washington, D.C.

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

4) WCH, 2007, *100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation*, 0100F-CA-V0305, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Calculate an HQ for each noncarcinogenic constituent detected above background and compare it to the individual HQ of <1.0 (DOE-RL 2005).

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

3) Calculate an excess cancer risk value for each carcinogenic constituent detected above background and compare it to the individual excess cancer risk criterion of $<1 \times 10^{-6}$ (DOE-RL 2005).

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

Washington Closure Hanford CALCULATION SHEET

Originator:	L.D. Habel	Date:	10/3/07	Calc. No.:	0100F-CA-V0311	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	10/3/07
Subject:	100-F-26:14 Hazard Quotient and Carcinogenic Risk Calculations				by S.W. Clark	Sheet No. 2 of 3	

METHODOLOGY:

HQ and carcinogenic risk calculations were conservatively calculated for the entire 100-F-26:14 waste site using the maximum of the statistically determined value for each analyte in all decision units (WCH 2007). Of the nonradionuclide contaminants of concern (COC) lead was the only analyte that required the HQ and risk calculations because it was quantified above background. Additionally, boron, hexavalent chromium, and molybdenum required the HQ and risk calculations because these COCs were detected and a Washington State or Hanford Site background value is not available. All other site nonradionuclide COCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum statistical result for molybdenum (0.56 mg/kg), divided by the noncarcinogenic RAG value of 400 mg/kg (calculated in accordance with the noncarcinogenic toxic effects WAC 173-340-740[3]), is 1.4×10^{-3}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculations are completed for the appropriate analytes, the cumulative HQ is 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 4.6×10^{-2} Comparing this values to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum statistical value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for hexavalent chromium is 0.38 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 1.8×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk is obtained by summing the individual values. The sum of the excess cancer risk values is 1.8×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

Table 1 shows the results of the calculation.

Washington Closure Hanford CALCULATION SHEET

Originator:	L.D. Habel LDH	Date:	10/3/07	Calc. No.:	0100F-CA-V0311	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	10/3/07
Subject:	100-F-26:14 Hazard Quotient and Carcinogenic Risk Calculations				by S.W.Clark DKDE	Sheet No.	3 of 3

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-F-26:14 Waste Site.

Contaminants of Potential Concern	Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	11.0	16,000	6.9E-04	--	--
Chromium, hexavalent[c]	0.38	240	1.6E-03	2.1	1.8E-07
Lead[d]	15.1	353	4.3E-02	--	--
Molybdenum	0.56	400	1.4E-03	--	--
Totals					
Cumulative Hazard Quotient:			**4.6E-02**		
Cumulative Excess Cancer Risk:					**1.8E-07**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = From Calculation No. 0100F-CA-V0305 (WCH 2007).
[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.
[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.
[d] = Value for the noncarcinogenic RAG obtained from EPA (1994).

CONCLUSION:

This calculation demonstrates that the 100-F-26:14 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).

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CALCULATION COVER SHEET

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

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0312

Subject: 100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief

Computer Program: RESRAD Program No: Version 6.3

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 – 5 pg Attm. 1 - 1 pg Attm. 2 - 19 pg Attm. 3 - 21 pg Attm. 4 - 10 pg Attm. 5 - 20 pg Attm. 6 - 21 pg Attm. 7 - 10 pg Total – 108 pages	S. W. Clark	H. M. Sulloway	N/A	S. W. Callison	10-4-07

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:	S. W. Clark	Date:	10/3/07	Calc. No.:	0100F-CA-V0312	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	10/3/07
Subject:	100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	1 of 5

PURPOSE:

Calculate the soil and groundwater concentrations, dose, and risk contributions from remaining radionuclide contaminants in the remediated 100-F-26:14 116-F5 Influent Pipelines areas (the excavation shallow zone and overburden/below cleanup level soil areas) over a period of 1,000 years.

GIVEN/REFERENCES:

1) Cleanup verification data from *100-F-26:14 116-F5 Influent Pipelines Cleanup Verification 95% UCL Calculation*, Calculation No. 0100F-CA-V0305, Rev. 0, Washington Closure Hanford, Richland, Washington (100-F-26:14 95% UCL Calculation).
2) *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) For the purpose of these RESRAD calculations, the radioactive contaminants of concern (COCs) established in the 100-F-26:14 95% UCL Calculation are cesium-137, cobalt-60, europium-152, nickel-63, and strontium-90.
4) The nonradionuclide COCs include barium, hexavalent chromium, lead, and mercury. The full suite of nonradionuclide contaminants of potential concern (COPCs) and attainment of their remediation goals are discussed in the 100-F-26:14 95% UCL Calculation. All nonradionuclide direct exposure RAGs are met and protection of groundwater and the river can be demonstrated by the results of vertical migration modeling in the *100 Area Analogous Sites RESRAD Calculations*, 0100X-CA-V0050, Rev. 0, Bechtel Hanford, Inc., Richland, Washington, which predicts that the nonradionuclides will not migrate to groundwater (and thus the Columbia River) within 1,000 years.
5) RESidual RADioactivity (RESRAD) computer code, version 6.3, to calculate compliance with residual radioactivity guidelines, developed for the U.S. Department of Energy by the Environmental Assessment Division of Argonne National Laboratory, Argonne, Illinois.
6) Sample design data from the *100-F-26:14 Shallow Zone and Overburden Sampling Plan*, Calculation No. 0100F-CA-V0309, Rev. 0, Washington Closure Hanford, Richland, Washington.
7) Groundwater elevation from *Hanford Groundwater Monitoring for Fiscal Year 2006,* PNNL-16346, Pacific Northwest National Laboratory, Richland, Washington.

SOLUTION:

1) Separate RESRAD runs were performed for the 100-F-26:14 116-F5 Influent Pipelines Excavation Shallow Zone and Overburden/Below Cleanup Level Stockpile soils. Table 1 shows the elevations (NAVD88) and thickness of each soil horizon. Attachment 1 shows representative dimensions of soil horizons and contaminant pathways considered for dose, risk, and groundwater protection. Input factors for each run are shown in the "Summary" section of the RESRAD "Mixture Sums and Single Radionuclide Guidelines" printouts in the Attachments to this Calculation Summary.

Washington Closure Hanford		CALCULATION SHEET					
Originator:	S. W. Clark	Date:	10/3/07	Calc. No.:	0100F-CA-V0312	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	10/3/07
Subject:	100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	12 of 15

Table 1. Waste Site Dimensions for RESRAD Modeling

Parameter	Units	Excavation Shallow Zone	OB/BCL
Contaminated Zone Dimensions			
Cover Depth	m	0	0
Area of Contaminated Zone (CZ)	m^2	655	789
Length Parallel to Aquifer Flow	m	30	40
Elevations of Vadose Zone Horizons			
Elevation: Surface	m	126.4	126.4
Elevation: Groundwater	m	114.0	114.0
Thickness: Contaminated Zone	m	4.6	4.6
Thickness: Unsaturated Zone	m	7.8	7.8

OB/BCL = Overburden/Below Cleanup Levels Stockpile

2) The year where the peak dose (or concentration) occurs from each individual radionuclide COC and layer is determined by a preliminary run. This year is 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 2007) for all COCs. For the water pathways (i.e. drinking water and food ingestion) the peak year was year 7 for cobalt-60, year 43 for cesium-137 and strontium-90, and year 135 for nickel-63. The 7-, 43-, and 135-year time periods were added to all RESRAD runs.

METHODOLOGY:

1) Runs of RESRAD version 6.3 were completed for the 100-F-26:14 116-F5 Influent Pipelines Excavation Shallow Zone and Overburden/Below Cleanup Level Stockpile soils using the radionuclide concentrations shown in Table 2. RESRAD numerical output reports for dose, risk, and concentration are presented in the Attachments to this calculation summary.

Table 2. Cleanup Verification Data Set Radionuclides (from the 100-F-26:14 95% UCL Calculation)

COCs	Excavation Shallow Zone	Overburden/Below Cleanup Levels Stockpile
Radionuclide Activity (pCi/g)		
Cesium-137	0.206	1.43
Cobalt-60	0.073	0.179
Europium-152	0.370	1.07
Nickel-63	--	7.04
Strontium-90	--	0.304

Washington Closure Hanford		CALCULATION SHEET					
Originator:	S. W. Clark	Date:	10/3/07	Calc. No.:	0100F-CA-V0312	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	10/3/07
Subject:	100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	8 of 5

RESULTS:

1) Radionuclide "All Pathways" Dose Rate

The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate from the 100-F-26:14 116-F5 Influent Pipelines is 10.0 mrem/yr at year zero (2007) from the Overburden/Below Cleanup Level Stockpile area. The maximum all-pathways dose rates from the Excavation Shallow Zone is 2.72 mrem/yr at year zero (2007).

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

RESRAD Run	Vadose Zone Horizons	"All Pathways" Dose Contributions in mrem/yr at Each Time Slice (yr)								
		0	1	3	7	11	43	135	300	1000
Excavation	Shallow Zone	2.72E+00	2.54E+00	2.23E+00	1.74E+00	1.39E+00	3.29E-01	2.01E-02	4.00E-04	3.25E-11
OB/BCL	Shallow Zone	1.00E+01	9.50E+00	8.55E+00	7.02E+00	5.85E+00	1.85E+00	1.64E-01	4.32E-03	5.29E-06

OB/BCL = Overburden/Below Cleanup Levels Stockpile

2) Radionuclide Excess Lifetime Cancer Risk

The radionuclide excess lifetime cancer risk (ELCR) results are shown in Table 4. The maximum ELCR for the 100-F-26:14 116-F5 Influent Pipelines is 1.21 x 10^{-4} at year zero (2007) for the Overburden/Below Cleanup Level Stockpile area. The maximum ELCR result for the Excavation Shallow Zone is 2.91 x 10^{-5}.

Table 4. Radionuclide Excess Lifetime Cancer Risk

RESRAD Run	Vadose Zone Horizons	Excess Cancer Risk at Each Time Slice (yr)								
		0	1	3	7	11	43	135	300	1000
Excavation	Shallow Zone	2.91E-05	2.75E-05	2.47E-05	2.01E-05	1.65E-05	4.51E-06	3.18E-07	6.43E-09	5.23E-16
OB/BCL	Shallow Zone	1.21E-04	1.16E-04	1.06E-04	8.99E-05	7.71E-05	2.71E-05	2.66E-06	9.92E-08	2.38E-10

OB/BCL = Overburden/Below Cleanup Levels Stockpile

3) Radionuclide Groundwater Protection

The radionuclide concentrations in groundwater calculated by the RESRAD model are summarized in Table 5. None of the radionuclide contaminants of concern are calculated to reach groundwater in the 1,000 years of the RESRAD model evaluation. Therefore calculation of organ specific dose via the groundwater (and river) pathway is not necessary to determine that the 4 mrem/yr drinking water dose limitation is met.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	10/3/07	Calc. No.:	0100F-CA-V0312	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	10/3/07
Subject:	100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No.	4 of 5

Table 5. Predicted Groundwater (Well Water/Drinking Water) Concentrations (2 Pages)

Radio-nuclides	RESRAD Run	Groundwater Concentrations in pCi/L at Each Time Slice (yr)									RAGs, pCi/L
		0	1	3	7	11	43	135	300	1000	
Co-60	Excavation SZ	0	0	0	0	0	0	0	0	0	100
	OB/BCL	0	0	0	0	0	0	0	0	0	
Cs-137	Excavation SZ	0	0	0	0	0	0	0	0	0	60
	OB/BCL	0	0	0	0	0	0	0	0	0	
Eu-152	Excavation SZ	0	0	0	0	0	0	0	0	0	200
	OB/BCL	0	0	0	0	0	0	0	0	0	
Ni-63	Excavation SZ	0	0	0	0	0	0	0	0	0	50
	OB/BCL	0	0	0	0	0	0	0	0	0	
Sr-90	Excavation SZ	0	0	0	0	0	0	0	0	0	8
	OB/BCL	0	0	0	0	0	0	0	0	0	

OB/BCL = Overburden/Below Cleanup Levels Stockpile
RAGs = Remedial action goals from the 100 Area RDR/RAWP
SZ = Shallow Zone

CONCLUSIONS:

- The "all pathways" (maximum) dose rates are shown in Table 3. The maximum all pathways dose rate from the 100-F-26:14 116-F5 Influent Pipelines is 10.0 mrem/yr at year zero (2007) from the Overburden/Below Cleanup Level Stockpile area. The maximum all-pathways dose rates from the Excavation Shallow Zone is 2.72 mrem/yr at year zero (2007).

- The radionuclide excess lifetime cancer risk (ELCR) results are shown in Table 4. The maximum ELCR for the 100-F-26:14 116-F5 Influent Pipelines is 1.21×10^{-4} at year zero (2007) for the Overburden/Below Cleanup Level Stockpile area. The maximum ELCR result for the Excavation Shallow Zone is 2.91×10^{-5}.

- The dominant pathway for the RESRAD evaluations dose rate for the Excavation Shallow Zone and the Overburden/Below Cleanup Level Stockpile area is direct external exposure due to europium-152.

- None of the site COCs are projected to exceed remedial action goals (RAGs).

- None of the radionuclide contaminants of concern are calculated to reach groundwater in the 1,000 years of the RESRAD model evaluation. Therefore it is not necessary to perform the calculation of organ specific dose via the groundwater (and river) pathway to determine that the 4 mrem/yr drinking water dose limitation is met.

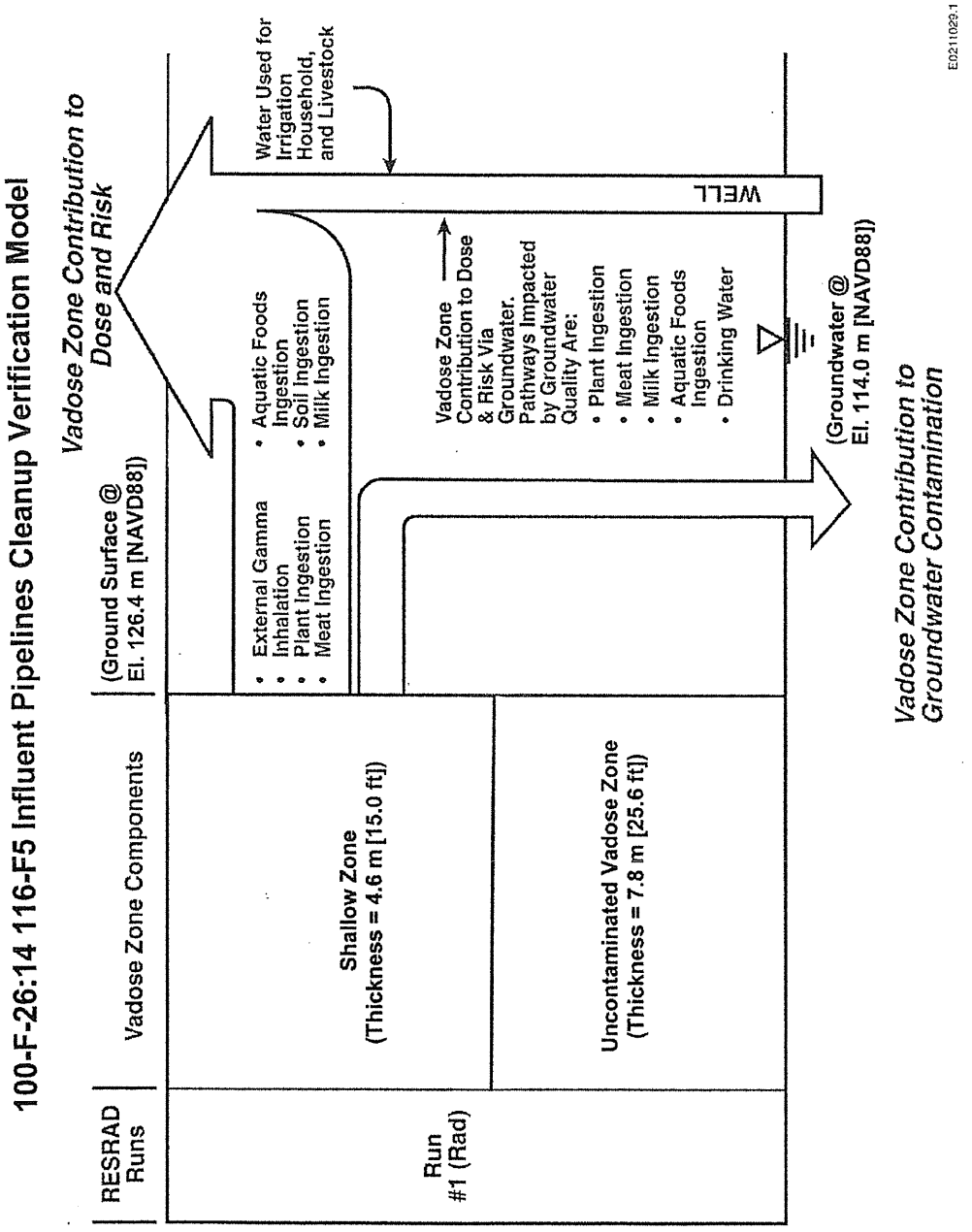
Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	10/3/07	Calc. No.:	0100F-CA-V0312	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	10/3/07
Subject:	100-F-26:14 116-F5 Influent Pipelines Cleanup Verification RESRAD Calculation Brief					Sheet No:	5 of 5

ATTACHMENTS:

1. Graphic showing 100-F-26:14 Cleanup Verification Model (1 page)
2. RESRAD Output: 100-F-26:14 Excavation Shallow Zone Radionuclides – Mixture Sums and Single Radionuclide Guidelines (19 pages)
3. RESRAD Output: 100-F-26:14 Excavation Shallow Zone Radionuclides – Intake Quantities and Health Risk Factors (21 pages)
4. RESRAD Output: 100-F-26:14 Excavation Shallow Zone Radionuclides – Concentration of Radionuclides, (10 pages)
5. RESRAD Output: 100-F-26:14 Overburden/Below Cleanup Level Radionuclides – Mixture Sums and Single Radionuclide Guidelines (20 pages)
6. RESRAD Output: 100-F-26:14 Overburden/Below Cleanup Level Radionuclides Radionuclides - Intake Quantities and Health Risk Factors (21 pages)
7. RESRAD Output: 100-F-26:14 Overburden/Below Cleanup Level Radionuclides Radionuclides - Concentration of Radionuclides (10 pages)

ATTACHMENT 1



Attachment 1 Sheet No. 1 of 1
Originator: S. W. Clark Date 10/3/07
Chk'd By H. M. Sulloway Date 10/9/07
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ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page   1
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD

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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 2
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Dose Conversion Factor (and Related) Parameter Summary
File: HEAST 2001 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Co-60	2.190E-04	2.190E-04	DCF2(1)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(2)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(3)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(5)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Co-60	2.690E-05	2.690E-05	DCF3(1)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(2)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(3)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(5)
D-34	Food transfer factors:			
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(1,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(1,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(2,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(3,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(3,3)
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(1,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(2,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(3,2)
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(5,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment 2 Sheet No. 2 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 3
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	6.550E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	4.600E+00	2.000E+00	---	THICKO
R011	Length parallel to aquifer flow (m)	3.000E+01	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)	7.000E+00	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.100E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	4.300E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.350E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	7.300E-02	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Cs-137	2.060E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Eu-152	3.700E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(3)
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)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	1.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	3.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.100E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	1.500E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.530E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.250E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.050E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	4.600E+00	1.000E+01	---	DWIBWT

Attachment 2 Sheet No. 3 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 4
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	7.800E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.600E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.500E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	1.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.050E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.166E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.166E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.426E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.316E-05	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
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

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Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 5
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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
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	0.328E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.327E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.327E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI

Attachment 2 Sheet No. 5 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 6
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F
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

Attachment 2 Sheet No. 6 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 2

```
1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page   7
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	5	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Attachment 2 Sheet No. 7 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page   8
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD

      Contaminated Zone Dimensions           Initial Soil Concentrations, pCi/g
      ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ           ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
        Area:    655.00 square meters               Co-60      7.300E-02
   Thickness:      4.60 meters                      Cs-137     2.060E-01
 Cover Depth:      0.00 meters                      Eu-152     3.700E-01
0
                                        Total Dose TDOSE(t), mrem/yr
                                   Basic Radiation Dose Limit = 1.500E+01 mrem/yr
                    Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
                    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
    t (years):  0.000E+00  1.000E+00  3.000E+00  7.000E+00  1.100E+01  4.300E+01  1.350E+02  3.000E+02  1.000E+03
     TDOSE(t):  2.715E+00  2.537E+00  2.225E+00  1.740E+00  1.387E+00  3.291E-01  2.012E-02  3.996E-04  3.247E-11
         M(t):  1.810E-01  1.691E-01  1.484E-01  1.160E-01  9.245E-02  2.194E-02  1.341E-03  2.664E-05  2.165E-12
OMaximum TDOSE(t):  2.715E+00 mrem/yr   at t = 0.000E+00 years
```

Attachment 2 Sheet No. 8 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 9
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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.
Co-60	7.104E-01	0.2617	4.850E-07	0.0000	0.000E+00	0.0000	5.798E-03	0.0021	2.751E-04	0.0001	6.303E-05	0.0000	7.512E-05	0.0000
Cs-137	4.189E-01	0.1543	1.994E-07	0.0000	0.000E+00	0.0000	1.521E-02	0.0056	1.173E-03	0.0004	7.287E-04	0.0003	3.940E-04	0.0001
Eu-152	1.561E+00	0.5751	2.481E-06	0.0000	0.000E+00	0.0000	2.213E-04	0.0001	3.789E-06	0.0000	2.503E-07	0.0000	9.171E-05	0.0000
Total	2.691E+00	0.9911	3.165E-06	0.0000	0.000E+00	0.0000	2.123E-02	0.0078	1.452E-03	0.0005	7.919E-04	0.0003	5.608E-04	0.0002

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.
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	7.166E-01	0.2640
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	4.364E-01	0.1608
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	1.562E+00	0.5753
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	2.715E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 9 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 10
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	6.227E-01	0.2455	4.252E-07	0.0000	0.000E+00	0.0000	5.083E-03	0.0020	2.411E-04	0.0001	5.525E-05	0.0000	6.585E-05	0.0000
Cs-137	4.092E-01	0.1613	1.948E-07	0.0000	0.000E+00	0.0000	1.486E-02	0.0059	1.146E-03	0.0005	7.119E-04	0.0003	3.849E-04	0.0002
Eu-152	1.482E+00	0.5842	2.355E-06	0.0000	0.000E+00	0.0000	2.101E-04	0.0001	3.597E-06	0.0000	2.376E-07	0.0000	8.706E-05	0.0000
Total	2.514E+00	0.9910	2.975E-06	0.0000	0.000E+00	0.0000	2.015E-02	0.0079	1.391E-03	0.0005	7.674E-04	0.0003	5.378E-04	0.0002

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-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	6.282E-01	0.2476
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	4.263E-01	0.1680
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	1.482E+00	0.5843
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	2.537E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 10 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 11
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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+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.
Co-60	4.785E-01	0.2150	3.267E-07	0.0000	0.000E+00	0.0000	3.906E-03	0.0018	1.853E-04	0.0001	4.245E-05	0.0000	5.060E-05	0.0000
Cs-137	3.906E-01	0.1755	1.859E-07	0.0000	0.000E+00	0.0000	1.418E-02	0.0064	1.094E-03	0.0005	6.794E-04	0.0003	3.674E-04	0.0002
Eu-152	1.336E+00	0.6001	2.122E-06	0.0000	0.000E+00	0.0000	1.893E-04	0.0001	3.241E-06	0.0000	2.142E-07	0.0000	7.845E-05	0.0000
Total	2.205E+00	0.9907	2.635E-06	0.0000	0.000E+00	0.0000	1.827E-02	0.0082	1.282E-03	0.0006	7.221E-04	0.0003	4.964E-04	0.0002

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.
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	4.827E-01	0.2169
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	4.069E-01	0.1828
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	1.336E+00	0.6003
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	2.225E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 11 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 12
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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 = 7.000E+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.
Co-60	2.825E-01	0.1623	1.929E-07	0.0000	0.000E+00	0.0000	2.306E-03	0.0013	1.094E-04	0.0001	2.507E-05	0.0000	2.987E-05	0.0000
Cs-137	3.558E-01	0.2044	1.693E-07	0.0000	0.000E+00	0.0000	1.292E-02	0.0074	9.965E-04	0.0006	6.189E-04	0.0004	3.347E-04	0.0002
Eu-152	1.085E+00	0.6231	1.723E-06	0.0000	0.000E+00	0.0000	1.537E-04	0.0001	2.632E-06	0.0000	1.739E-07	0.0000	6.371E-05	0.0000
Total	1.723E+00	0.9899	2.086E-06	0.0000	0.000E+00	0.0000	1.538E-02	0.0088	1.109E-03	0.0006	6.442E-04	0.0004	4.282E-04	0.0002

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
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	2.850E-01	0.1638
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	3.707E-01	0.2130
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	1.085E+00	0.6233
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	1.740E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 12 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 13
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	1.668E-01	0.1203	1.139E-07	0.0000	0.000E+00	0.0000	1.362E-03	0.0010	6.459E-05	0.0000	1.480E-05	0.0000	1.764E-05	0.0000
Cs-137	3.241E-01	0.2337	1.543E-07	0.0000	0.000E+00	0.0000	1.177E-02	0.0085	9.077E-04	0.0007	5.638E-04	0.0004	3.048E-04	0.0002
Eu-152	8.807E-01	0.6351	1.399E-06	0.0000	0.000E+00	0.0000	1.248E-04	0.0001	2.137E-06	0.0000	1.412E-07	0.0000	5.173E-05	0.0000
Total	1.372E+00	0.9891	1.668E-06	0.0000	0.000E+00	0.0000	1.325E-02	0.0096	9.745E-04	0.0007	5.787E-04	0.0004	3.742E-04	0.0003

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years

Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	1.683E-01	0.1213
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	3.376E-01	0.2435
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	8.809E-01	0.6352
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	1.387E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 13 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page  14
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.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 = 4.300E+01 years
0                                  Water Independent Pathways (Inhalation excludes radon)
0          Ground          Inhalation          Radon           Plant           Meat            Milk            Soil
 Radio-  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 Nuclide mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.
 ÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ
 Co-60   2.464E-03 0.0075  1.683E-09 0.0000  0.000E+00 0.0000  2.011E-05 0.0001  9.542E-07 0.0000  2.186E-07 0.0000  2.606E-07 0.0000
 Cs-137  1.537E-01 0.4669  7.314E-08 0.0000  0.000E+00 0.0000  5.579E-03 0.0170  4.304E-04 0.0013  2.673E-04 0.0008  1.445E-04 0.0004
 Eu-152  1.665E-01 0.5059  2.646E-07 0.0000  0.000E+00 0.0000  2.360E-05 0.0001  4.041E-07 0.0000  2.670E-08 0.0000  9.780E-06 0.0000
 ÍÍÍÍÍÍÍ ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ
 Total   3.226E-01 0.9803  3.394E-07 0.0000  0.000E+00 0.0000  5.622E-03 0.0171  4.317E-04 0.0013  2.676E-04 0.0008  1.546E-04 0.0005
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 = 4.300E+01 years
0                                    Water Dependent Pathways
0           Water            Fish            Radon           Plant           Meat            Milk          All Pathways*
 Radio-  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
 Nuclide mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.
 ÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄ
 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  2.486E-03 0.0076
 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  1.601E-01 0.4864
 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  1.665E-01 0.5060
 ÍÍÍÍÍÍÍ ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍ ÍÍÍÍÍÍ
 Total   0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  0.000E+00 0.0000  3.291E-01 1.0000
0*Sum of all water independent and dependent pathways.
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Attachment 2 Sheet No. 14 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 15
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.350E+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.
Co-60	1.345E-08	0.0000	9.186E-15	0.0000	0.000E+00	0.0000	1.098E-10	0.0000	5.210E-12	0.0000	1.194E-12	0.0000	1.423E-12	0.0000
Cs-137	1.798E-02	0.8938	8.557E-09	0.0000	0.000E+00	0.0000	6.527E-04	0.0324	5.035E-05	0.0025	3.128E-05	0.0016	1.691E-05	0.0008
Eu-152	1.386E-03	0.0689	2.202E-09	0.0000	0.000E+00	0.0000	1.964E-07	0.0000	3.362E-09	0.0000	2.222E-10	0.0000	8.139E-08	0.0000
Total	1.936E-02	0.9626	1.076E-08	0.0000	0.000E+00	0.0000	6.529E-04	0.0325	5.036E-05	0.0025	3.128E-05	0.0016	1.699E-05	0.0008

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.350E+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.
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	1.357E-08	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	1.873E-02	0.9311
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	1.386E-03	0.0689
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	2.012E-02	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 15 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 16
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	4.899E-18	0.0000	3.345E-24	0.0000	0.000E+00	0.0000	3.999E-20	0.0000	1.897E-21	0.0000	4.346E-22	0.0000	5.180E-22	0.0000
Cs-137	3.833E-04	0.9593	1.824E-10	0.0000	0.000E+00	0.0000	1.392E-05	0.0348	1.074E-06	0.0027	6.668E-07	0.0017	3.605E-07	0.0009
Eu-152	2.580E-07	0.0006	4.100E-13	0.0000	0.000E+00	0.0000	3.656E-11	0.0000	6.260E-13	0.0000	4.136E-14	0.0000	1.515E-11	0.0000
Total	3.836E-04	0.9599	1.829E-10	0.0000	0.000E+00	0.0000	1.392E-05	0.0348	1.074E-06	0.0027	6.668E-07	0.0017	3.606E-07	0.0009

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	4.942E-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	3.993E-04	0.9994
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	2.580E-07	0.0006
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.996E-04	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 16 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 17
Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
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.
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	3.117E-11	0.9599	1.483E-17	0.0000	0.000E+00	0.0000	1.131E-12	0.0348	8.729E-14	0.0027	5.421E-14	0.0017	2.931E-14	0.0009
Eu-152	3.864E-23	0.0000	9.270E-17	0.0000	0.000E+00	0.0000	1.868E-16	0.0000	3.199E-18	0.0000	8.455E-20	0.0000	7.744E-17	0.0000
Total	3.117E-11	0.9599	1.075E-16	0.0000	0.000E+00	0.0000	1.132E-12	0.0349	8.729E-14	0.0027	5.421E-14	0.0017	2.939E-14	0.0009

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.
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	3.247E-11	1.0000
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	3.603E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.247E-11	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 2 Sheet No. 17 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page  18
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD

                                  Dose/Source Ratios Summed Over All Pathways
                              Parent and Progeny Principal Radionuclide Contributions Indicated
0  Parent    Product    Thread                        DSR(j,t) At Time in Years   (mrem/yr)/(pCi/g)
    (i)        (j)     Fraction   0.000E+00 1.000E+00 3.000E+00 7.000E+01 1.100E+01 4.300E+01 1.350E+02 3.000E+02 1.000E+03
 ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ
 Co-60      Co-60      1.000E+00  9.817E+00 8.605E+00 6.612E+00 3.904E+00 2.305E+00 3.405E-02 1.859E-07 6.769E-17 0.000E+00
0Cs-137+D   Cs-137+D   1.000E+00  2.118E+00 2.070E+00 1.975E+00 1.799E+00 1.639E+00 7.771E-01 9.092E-02 1.939E-03 1.576E-10
0Eu-152     Eu-152     7.208E-01  3.042E+00 2.888E+00 2.602E+00 2.113E+00 1.716E+00 3.244E-01 2.700E-03 5.026E-07 7.529E-23
0Eu-152     Eu-152     2.792E-01  1.178E+00 1.119E+00 1.008E+00 8.186E-01 6.647E-01 1.257E-01 1.046E-03 1.947E-07 2.916E-23
 Eu-152     Gd-152     2.792E-01  0.000E+00 5.003E-17 1.426E-16 3.012E-16 4.299E-16 8.808E-16 9.839E-16 9.827E-16 9.737E-16
 Eu-152     äDSR(j)               1.178E+00 1.119E+00 1.008E+00 8.186E-01 6.647E-01 1.257E-01 1.046E-03 1.947E-07 9.737E-16
 íííííííííí íííííííííí íííííííí  íííííííí íííííííí íííííííí íííííííí íííííííí íííííííí íííííííí íííííííí íííííííí
 The DSR includes contributions from associated (half-life ó 180 days) daughters.
0
                                  Single Radionuclide Soil Guidelines G(i,t) in pCi/g
                                     Basic Radiation Dose Limit = 1.500E+01 mrem/yr
0Nuclide
   (i)     t= 0.000E+00   1.000E+00   3.000E+00   7.000E+00   1.100E+01   4.300E+01   1.350E+02   3.000E+02   1.000E+03
 ÄÄÄÄÄÄÄÄ    ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ
 Co-60       1.528E+00  1.743E+00  2.269E+00  3.842E+00  6.507E+00  4.405E+02  8.068E+07 *1.132E+15 *1.132E+15
 Cs-137      7.081E+00  7.248E+00  7.594E+00  8.337E+00  9.152E+00  1.930E+01  1.650E+02  7.738E+03  9.517E+10
 Eu-152      3.554E+00  3.744E+00  4.155E+00  5.116E+00  6.301E+00  3.333E+01  4.005E+03  2.151E+07 *1.765E+14
 íííííííí    íííííííííí íííííííííí íííííííííí íííííííííí íííííííííí íííííííííí íííííííííí íííííííííí íííííííííí
 *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  Initial        tmin       DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)
   (i)    (pCi/g)      (years)                   (pCi/g)               (pCi/g)
 ÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ
 Co-60   7.300E-02    0.000E+00    9.817E+00 1.528E+00 9.817E+00 1.528E+00
 Cs-137  2.060E-01    0.000E+00    2.118E+00 7.081E+00 2.118E+00 7.081E+00
 Eu-152  3.700E-01    0.000E+00    4.221E+00 3.554E+00 4.221E+00 3.554E+00
 íííííííí íííííííííí íííííííííííííííííí íííííííííí íííííííííí íííííííííí íííííííííí
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Attachment 2 Sheet No. 18 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 2

```
1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page  19
 Summary : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD
```

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	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	7.166E-01	6.282E-01	4.827E-01	2.850E-01	1.683E-01	2.486E-03	1.357E-08	4.942E-18	0.000E+00
OCs-137	Cs-137	1.000E+00	4.364E-01	4.263E-01	4.069E-01	3.707E-01	3.376E-01	1.601E-01	1.873E-02	3.993E-04	3.247E-11
OEu-152	Eu-152	7.208E-01	1.126E+00	1.069E+00	9.629E-01	7.819E-01	6.349E-01	1.200E-01	9.989E-04	1.860E-07	2.786E-23
Eu-152	Eu-152	2.792E-01	4.360E-01	4.139E-01	3.730E-01	3.029E-01	2.459E-01	4.650E-02	3.869E-04	7.204E-08	1.079E-23
Eu-152	äDOSE(j)		1.562E+00	1.482E+00	1.336E+00	1.085E+00	8.809E-01	1.665E-01	1.386E-03	2.580E-07	3.865E-23
OGd-152	Eu-152	2.792E-01	0.000E+00	1.851E-17	5.276E-17	1.114E-16	1.591E-16	3.259E-16	3.641E-16	3.636E-16	3.603E-16

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	7.300E-02	6.399E-02	4.917E-02	2.903E-02	1.714E-02	2.532E-04	1.383E-09	5.034E-19	0.000E+00
OCs-137	Cs-137	1.000E+00	2.060E-01	2.013E-01	1.921E-01	1.750E-01	1.594E-01	7.557E-02	8.842E-03	1.885E-04	1.533E-11
OEu-152	Eu-152	7.208E-01	2.667E-01	2.532E-01	2.281E-01	1.853E-01	1.504E-01	2.844E-02	2.367E-04	4.406E-08	6.600E-24
Eu-152	Eu-152	2.792E-01	1.033E-01	9.806E-02	8.837E-02	7.176E-02	5.827E-02	1.102E-02	9.167E-05	1.707E-08	2.557E-24
Eu-152	äS(j):		3.700E-01	3.512E-01	3.165E-01	2.570E-01	2.087E-01	3.946E-02	3.283E-04	6.113E-08	9.157E-24
OGd-152	Eu-152	2.792E-01	0.000E+00	6.460E-16	1.841E-15	3.889E-15	5.552E-15	1.137E-14	1.271E-14	1.269E-14	1.257E-14

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

```
ORESCALC.EXE execution time =    5.28 seconds
```

Attachment 2 Sheet No. 19 of 19
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

```
1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  14:48  Page   1
 Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD

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   Part III: Intake Quantities and Health Risk Factors
   ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ

 Cancer Risk Slope Factors ..............................   2
 Risk Slope and ETFG for the Ground Pathway .............   3
 Amount of Intake Quantities and Excess Cancer Risks
      Time= 0.000E+00 ..................................   4
      Time= 1.000E+00 ..................................   6
      Time= 3.000E+00 ..................................   8
      Time= 7.000E+00 ..................................  10
      Time= 1.100E+01 ..................................  12
      Time= 4.300E+01 ..................................  14
      Time= 1.350E+02 ..................................  16
      Time= 3.000E+02 ..................................  18
      Time= 1.000E+03 ..................................  20
```

Attachment 3 Sheet No. 1 of 21
Originator: S. W. Clark Date 10/3/07
Chk'd By H. M. Sulloway Date 10/3/07
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 2
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Cancer Risk Slope Factors Summary Table
Risk Library: HEAST 2001 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Co-60	1.24E-05	1.24E-05	SLPF(1,1)
Sf-1	Cs-137+D	2.55E-06	5.32E-10	SLPF(2,1)
Sf-1	Eu-152	5.30E-06	5.30E-06	SLPF(3,1)
Sf-1	Gd-152	0.00E+00	0.00E+00	SLPF(5,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Co-60	3.58E-11	3.58E-11	SLPF(1,2)
Sf-2	Cs-137+D	1.19E-11	1.19E-11	SLPF(2,2)
Sf-2	Eu-152	9.10E-11	9.10E-11	SLPF(3,2)
Sf-2	Gd-152	9.10E-09	9.10E-09	SLPF(5,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	2.23E-11	2.23E-11	SLPF(1,3)
Sf-3	Cs-137+D	3.74E-11	3.74E-11	SLPF(2,3)
Sf-3	Eu-152	8.70E-12	8.70E-12	SLPF(3,3)
Sf-3	Gd-152	3.85E-11	3.85E-11	SLPF(5,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	1.57E-11	1.57E-11	SLPF(1,4)
Sf-3	Cs-137+D	3.04E-11	3.04E-11	SLPF(2,4)
Sf-3	Eu-152	6.07E-12	6.07E-12	SLPF(3,4)
Sf-3	Gd-152	2.97E-11	2.97E-11	SLPF(5,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	4.03E-11	4.03E-11	SLPF(1,5)
Sf-3	Cs-137+D	4.33E-11	4.33E-11	SLPF(2,5)
Sf-3	Eu-152	1.62E-11	1.62E-11	SLPF(3,5)
Sf-3	Gd-152	6.29E-11	6.29E-11	SLPF(5,5)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment 3 Sheet No. 2 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 3
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Risk Slope and Environmental Transport Factors for the Ground Pathway

ONuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless)								
	t=	0.000E+00	1.000E+00	3.000E+00	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Ba-137m	2.690E-06	5.961E-01	5.961E-01	5.961E-01	5.961E-01	5.961E-01	5.961E-01	5.961E-01	5.961E-01	5.961E-01
Co-60	1.240E-05	6.002E-01	6.002E-01	6.002E-01	6.002E-01	6.002E-01	6.002E-01	6.002E-01	6.002E-01	6.002E-01
Cs-137	5.320E-10	6.152E-01	6.152E-01	6.152E-01	6.152E-01	6.152E-01	6.152E-01	6.152E-01	6.152E-01	6.152E-01
Eu-152	5.300E-06	6.024E-01	6.024E-01	6.024E-01	6.024E-01	6.024E-01	6.024E-01	6.024E-01	6.024E-01	6.024E-01
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	0.000E+00

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Attachment 3 Sheet No. 3 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 4
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	2.215E-03	2.156E+02	1.023E+01	2.343E+00	2.792E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.309E+02
Cs-137	6.250E-03	3.041E+02	2.346E+01	1.457E+01	7.880E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.501E+02
Eu-152	1.123E-02	3.415E+01	5.847E-01	3.863E-02	1.415E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.893E+01
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	0.000E+00	0.000E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	4.064E-06	0.1398	5.932E-13	0.0000	3.596E-08	0.0012	1.706E-09	0.0001	3.909E-10	0.0000	8.419E-10	0.0000
Cs-137	6.744E-06	0.2320	1.605E-12	0.0000	2.454E-07	0.0084	1.894E-08	0.0007	1.176E-08	0.0004	7.363E-09	0.0003
Eu-152	1.793E-05	0.6169	1.551E-11	0.0000	4.511E-09	0.0002	7.723E-11	0.0000	5.103E-12	0.0000	3.481E-09	0.0001
Gd-152	0.000E+00	0.0000	5.210E-23	0.0000	6.705E-22	0.0000	1.148E-23	0.0000	3.035E-25	0.0000	4.540E-22	0.0000
Total	2.874E-05	0.9886	1.771E-11	0.0000	2.859E-07	0.0098	2.072E-08	0.0007	1.216E-08	0.0004	1.169E-08	0.0004

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	4.103E-06	0.1411
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	7.028E-06	0.2417
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	1.794E-05	0.6171
Gd-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	1.188E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.907E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 4 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 5
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	4.064E-06	0.1398	5.932E-13	0.0000	0.000E+00	0.0000	3.596E-08	0.0012	1.706E-09	0.0001	3.909E-10	0.0000	8.419E-10	0.0000
Cs-137	6.744E-06	0.2320	1.605E-12	0.0000	0.000E+00	0.0000	2.454E-07	0.0084	1.894E-08	0.0007	1.176E-08	0.0004	7.363E-09	0.0003
Eu-152	1.793E-05	0.6169	1.551E-11	0.0000	0.000E+00	0.0000	4.511E-09	0.0002	7.723E-11	0.0000	5.103E-12	0.0000	3.481E-09	0.0001
Total	2.874E-05	0.9886	1.771E-11	0.0000	0.000E+00	0.0000	2.859E-07	0.0098	2.072E-08	0.0007	1.216E-08	0.0004	1.169E-08	0.0004

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	4.103E-06	0.1411
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	7.028E-06	0.2417
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	1.794E-05	0.6171
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	2.907E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 5 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 6
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	1.941E-03	1.890E+02	8.964E+00	2.054E+00	2.448E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.024E+02
Cs-137	6.106E-03	2.971E+02	2.292E+01	1.424E+01	7.698E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.420E+02
Eu-152	1.066E-02	3.242E+01	5.551E-01	3.667E-02	1.344E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.644E+01
Gd-152	1.960E-17	5.963E-14	1.021E-15	2.709E-17	2.471E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.539E-14

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	3.563E-06	0.1296	5.200E-13	0.0000	3.152E-08	0.0011	1.495E-09	0.0001	3.427E-10	0.0000	7.380E-10	0.0000
Cs-137	6.589E-06	0.2396	1.568E-12	0.0000	2.398E-07	0.0087	1.850E-08	0.0007	1.149E-08	0.0004	7.193E-09	0.0003
Eu-152	1.703E-05	0.6192	1.472E-11	0.0000	4.282E-09	0.0002	7.332E-11	0.0000	4.844E-12	0.0000	3.305E-09	0.0001
Gd-152	0.000E+00	0.0000	5.481E-23	0.0000	7.054E-22	0.0000	1.208E-23	0.0000	3.193E-25	0.0000	4.776E-22	0.0000
Total	2.718E-05	0.9884	1.681E-11	0.0000	2.756E-07	0.0100	2.007E-08	0.0007	1.184E-08	0.0004	1.124E-08	0.0004

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	3.597E-06	0.1308
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	6.866E-06	0.2497
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	1.703E-05	0.6195
Gd-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	1.250E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.750E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 6 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 7
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	3.563E-06	0.1296	5.200E-13	0.0000	0.000E+00	0.0000	3.152E-08	0.0011	1.495E-09	0.0001	3.427E-10	0.0000	7.380E-10	0.0000
Cs-137	6.589E-06	0.2396	1.568E-12	0.0000	0.000E+00	0.0000	2.398E-07	0.0087	1.850E-08	0.0007	1.149E-08	0.0004	7.193E-09	0.0003
Eu-152	1.703E-05	0.6192	1.472E-11	0.0000	0.000E+00	0.0000	4.282E-09	0.0002	7.332E-11	0.0000	4.844E-12	0.0000	3.305E-09	0.0001
Total	2.718E-05	0.9884	1.681E-11	0.0000	0.000E+00	0.0000	2.756E-07	0.0100	2.007E-08	0.0007	1.184E-08	0.0004	1.124E-08	0.0004

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.597E-06	0.1308
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	6.866E-06	0.2497
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	1.703E-05	0.6195
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	2.750E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 7 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 8
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio-Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	1.492E-03	1.452E+02	6.888E+00	1.578E+00	1.881E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.555E+02
Cs-137	5.828E-03	2.836E+02	2.188E+01	1.359E+01	7.347E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.264E+02
Eu-152	9.603E-03	2.921E+01	5.002E-01	3.305E-02	1.211E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.185E+01
Gd-152	5.587E-17	1.700E-13	2.910E-15	7.701E-17	7.044E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.434E-13

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	2.738E-06	0.1110	3.995E-13	0.0000	2.422E-08	0.0010	1.149E-09	0.0000	2.633E-10	0.0000	5.671E-10	0.0000
Cs-137	6.288E-06	0.2549	1.496E-12	0.0000	2.289E-07	0.0093	1.766E-08	0.0007	1.097E-08	0.0004	6.865E-09	0.0003
Eu-152	1.534E-05	0.6220	1.327E-11	0.0000	3.859E-09	0.0002	6.607E-11	0.0000	4.365E-12	0.0000	2.978E-09	0.0001
Gd-152	0.000E+00	0.0000	5.982E-23	0.0000	7.698E-22	0.0000	1.318E-23	0.0000	3.484E-25	0.0000	5.213E-22	0.0000
Total	2.437E-05	0.9879	1.516E-11	0.0000	2.569E-07	0.0104	1.887E-08	0.0008	1.123E-08	0.0005	1.041E-08	0.0004

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Plant		Meat		Milk		All Pathways**	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	2.764E-06	0.1121
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	6.553E-06	0.2657
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	1.535E-05	0.6223
Gd-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	1.364E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.467E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 8 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 9
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	2.738E-06	0.1110	3.995E-13	0.0000	0.000E+00	0.0000	2.422E-08	0.0010	1.149E-09	0.0000	2.633E-10	0.0000	5.671E-10	0.0000
Cs-137	6.288E-06	0.2549	1.496E-12	0.0000	0.000E+00	0.0000	2.289E-07	0.0093	1.766E-08	0.0007	1.097E-08	0.0004	6.865E-09	0.0003
Eu-152	1.534E-05	0.6220	1.327E-11	0.0000	0.000E+00	0.0000	3.859E-09	0.0002	6.607E-11	0.0000	4.365E-12	0.0000	2.978E-09	0.0001
Total	2.437E-05	0.9879	1.516E-11	0.0000	0.000E+00	0.0000	2.569E-07	0.0104	1.887E-08	0.0008	1.123E-08	0.0005	1.041E-08	0.0004

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	2.764E-06	0.1121
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	6.553E-06	0.2657
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	1.535E-05	0.6223
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	2.467E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 9 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 10
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 7.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	8.808E-04	8.573E+01	4.067E+00	9.319E-01	1.111E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.184E+01
Cs-137	5.308E-03	2.583E+02	1.993E+01	1.238E+01	6.693E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.973E+02
Eu-152	7.798E-03	2.372E+01	4.062E-01	2.684E-02	9.831E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.399E+01
Gd-152	1.180E-16	3.590E-13	6.146E-15	1.625E-16	1.488E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.140E-13

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Plant		Meat		Milk		Soil	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	1.616E-06	0.0806	2.359E-13	0.0000	1.430E-08	0.0007	6.785E-10	0.0000	1.555E-10	0.0000	3.348E-10	0.0000
Cs-137	5.728E-06	0.2855	1.363E-12	0.0000	2.085E-07	0.0104	1.608E-08	0.0008	9.990E-09	0.0005	6.254E-09	0.0003
Eu-152	1.246E-05	0.6209	1.077E-11	0.0000	3.133E-09	0.0002	5.365E-11	0.0000	3.545E-12	0.0000	2.418E-09	0.0001
Gd-152	0.000E+00	0.0000	6.840E-23	0.0000	8.803E-22	0.0000	1.507E-23	0.0000	3.984E-25	0.0000	5.961E-22	0.0000
Total	1.980E-05	0.9869	1.237E-11	0.0000	2.259E-07	0.0113	1.682E-08	0.0008	1.015E-08	0.0005	9.006E-09	0.0004

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Plant		Meat		Milk		All Pathways**	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	1.632E-06	0.0813
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	5.969E-06	0.2975
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	1.246E-05	0.6212
Gd-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	1.560E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.006E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 10 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 11
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	1.616E-06	0.0806	2.359E-13	0.0000	0.000E+00	0.0000	1.430E-08	0.0007	6.785E-10	0.0000	1.555E-10	0.0000	3.348E-10	0.0000
Cs-137	5.728E-06	0.2855	1.363E-12	0.0000	0.000E+00	0.0000	2.085E-07	0.0104	1.608E-08	0.0008	9.990E-09	0.0005	6.254E-09	0.0003
Eu-152	1.246E-05	0.6209	1.077E-11	0.0000	0.000E+00	0.0000	3.133E-09	0.0002	5.365E-11	0.0000	3.545E-12	0.0000	2.418E-09	0.0001
Total	1.980E-05	0.9869	1.237E-11	0.0000	0.000E+00	0.0000	2.259E-07	0.0113	1.682E-08	0.0008	1.015E-08	0.0005	9.006E-09	0.0004

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	1.632E-06	0.0813
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	5.969E-06	0.2975
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.246E-05	0.6212
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	2.006E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 11 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 12
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.100E+01 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	5.201E-04	5.062E+01	2.401E+00	5.502E-01	6.557E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.423E+01
Cs-137	4.836E-03	2.353E+02	1.815E+01	1.128E+01	6.097E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.708E+02
Eu-152	6.332E-03	1.926E+01	3.298E-01	2.179E-02	7.983E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.760E+01
Gd-152	1.684E-16	5.124E-13	8.774E-15	2.320E-16	2.124E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.338E-13

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	9.544E-07	0.0578	1.393E-13	0.0000	8.445E-09	0.0005	4.006E-10	0.0000	9.179E-11	0.0000	1.977E-10	0.0000
Cs-137	5.218E-06	0.3158	1.242E-12	0.0000	1.899E-07	0.0115	1.465E-08	0.0009	9.100E-09	0.0006	5.697E-09	0.0003
Eu-152	1.012E-05	0.6123	8.748E-12	0.0000	2.544E-09	0.0002	4.356E-11	0.0000	2.878E-12	0.0000	1.964E-09	0.0001
Gd-152	0.000E+00	0.0000	7.536E-23	0.0000	9.700E-22	0.0000	1.661E-23	0.0000	4.390E-25	0.0000	6.568E-22	0.0000
Total	1.629E-05	0.9859	1.013E-11	0.0000	2.009E-07	0.0122	1.510E-08	0.0009	9.195E-09	0.0006	7.858E-09	0.0005

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	9.636E-07	0.0583
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	5.437E-06	0.3291
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	1.012E-05	0.6126
Gd-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	1.719E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.652E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 12 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 13
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	9.544E-07	0.0578	1.393E-13	0.0000	0.000E+00	0.0000	8.445E-09	0.0005	4.006E-10	0.0000	9.179E-11	0.0000	1.977E-10	0.0000
Cs-137	5.218E-06	0.3158	1.242E-12	0.0000	0.000E+00	0.0000	1.899E-07	0.0115	1.465E-08	0.0009	9.100E-09	0.0006	5.697E-09	0.0003
Eu-152	1.012E-05	0.6123	8.748E-12	0.0000	0.000E+00	0.0000	2.544E-09	0.0002	4.356E-11	0.0000	2.878E-12	0.0000	1.964E-09	0.0001
Total	1.629E-05	0.9859	1.013E-11	0.0000	0.000E+00	0.0000	2.009E-07	0.0122	1.510E-08	0.0009	9.195E-09	0.0006	7.858E-09	0.0005

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	9.636E-07	0.0583
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	5.437E-06	0.3291
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	1.012E-05	0.6126
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	1.652E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 13 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 14
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 4.300E+01 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	7.683E-06	7.477E-01	3.547E-02	8.128E-03	9.687E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.010E-01
Cs-137	2.293E-03	1.116E+02	8.607E+00	5.346E+00	2.891E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.284E+02
Eu-152	1.197E-03	3.642E+00	6.235E-02	4.120E-03	1.509E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.217E+00
Gd-152	3.451E-16	1.050E-12	1.798E-14	4.751E-16	4.351E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.503E-12

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	1.410E-08	0.0031	2.058E-15	0.0000	1.247E-10	0.0000	5.918E-12	0.0000	1.356E-12	0.0000	2.920E-12	0.0000
Cs-137	2.474E-06	0.5491	5.887E-13	0.0000	9.004E-08	0.0200	6.947E-09	0.0015	4.315E-09	0.0010	2.701E-09	0.0006
Eu-152	1.913E-06	0.4245	1.654E-12	0.0000	4.810E-10	0.0001	8.236E-12	0.0000	5.442E-13	0.0000	3.712E-10	0.0001
Gd-152	0.000E+00	0.0000	9.975E-23	0.0000	1.284E-21	0.0000	2.198E-23	0.0000	5.810E-25	0.0000	8.693E-22	0.0000
Total	4.401E-06	0.9767	2.245E-12	0.0000	9.065E-08	0.0201	6.961E-09	0.0015	4.316E-09	0.0010	3.075E-09	0.0007

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	1.423E-08	0.0032
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	2.578E-06	0.5722
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	1.913E-06	0.4247
Gd-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	2.275E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.506E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 14 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 15
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	1.410E-08	0.0031	2.058E-15	0.0000	0.000E+00	0.0000	1.247E-10	0.0000	5.918E-12	0.0000	1.356E-12	0.0000	2.920E-12	0.0000
Cs-137	2.474E-06	0.5491	5.887E-13	0.0000	0.000E+00	0.0000	9.004E-08	0.0200	6.947E-09	0.0015	4.315E-09	0.0010	2.701E-09	0.0006
Eu-152	1.913E-06	0.4245	1.654E-12	0.0000	0.000E+00	0.0000	4.810E-10	0.0001	8.236E-12	0.0000	5.442E-13	0.0000	3.712E-10	0.0001
Total	4.401E-06	0.9767	2.245E-12	0.0000	0.000E+00	0.0000	9.065E-08	0.0201	6.961E-09	0.0015	4.316E-09	0.0010	3.075E-09	0.0007

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	1.423E-08	0.0032
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	2.578E-06	0.5722
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	1.913E-06	0.4247
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.506E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 15 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 16
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.350E+02 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	4.195E-11	4.082E-06	1.937E-07	4.438E-08	5.289E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.373E-06
Cs-137	2.682E-04	1.305E+01	1.007E+00	6.255E-01	3.382E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.502E+01
Eu-152	9.962E-06	3.030E-02	5.189E-04	3.428E-05	1.256E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.342E-02
Gd-152	3.855E-16	1.173E-12	2.008E-14	5.307E-16	4.860E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.679E-12

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Plant		Meat		Milk		Soil	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	7.698E-14	0.0000	1.123E-20	0.0000	6.811E-16	0.0000	3.231E-17	0.0000	7.403E-18	0.0000	1.594E-17	0.0000
Cs-137	2.895E-07	0.9115	6.888E-14	0.0000	1.053E-08	0.0332	8.127E-10	0.0026	5.048E-10	0.0016	3.160E-10	0.0010
Eu-152	1.592E-08	0.0501	1.376E-14	0.0000	4.003E-12	0.0000	6.854E-14	0.0000	4.529E-15	0.0000	3.089E-12	0.0000
Gd-152	0.000E+00	0.0000	1.053E-22	0.0000	1.355E-21	0.0000	2.320E-23	0.0000	6.131E-25	0.0000	9.174E-22	0.0000
Total	3.054E-07	0.9617	8.264E-14	0.0000	1.054E-08	0.0332	8.128E-10	0.0026	5.048E-10	0.0016	3.191E-10	0.0010

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Plant		Meat		Milk		All Pathways**	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	7.772E-14	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	3.016E-07	0.9499
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	1.592E-08	0.0501
Gd-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	2.401E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.176E-07	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 16 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 17
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	7.698E-14	0.0000	1.123E-20	0.0000	0.000E+00	0.0000	6.811E-16	0.0000	3.231E-17	0.0000	7.403E-18	0.0000	1.594E-17	0.0000
Cs-137	2.895E-07	0.9115	6.888E-14	0.0000	0.000E+00	0.0000	1.053E-08	0.0332	8.127E-10	0.0026	5.048E-10	0.0016	3.160E-10	0.0010
Eu-152	1.592E-08	0.0501	1.376E-14	0.0000	0.000E+00	0.0000	4.003E-12	0.0000	6.854E-14	0.0000	4.529E-15	0.0000	3.089E-12	0.0000
Total	3.054E-07	0.9617	8.264E-14	0.0000	0.000E+00	0.0000	1.054E-08	0.0332	8.128E-10	0.0026	5.048E-10	0.0016	3.191E-10	0.0010

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	7.772E-14	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	3.016E-07	0.9499
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	1.592E-08	0.0501
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.176E-07	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 17 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 18
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio-Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	1.527E-20	1.486E-15	7.051E-17	1.616E-17	1.926E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.592E-15
Cs-137	5.719E-06	2.783E-01	2.147E-02	1.334E-02	7.211E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.203E-01
Eu-152	1.855E-09	5.642E-06	9.661E-08	6.383E-09	2.338E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.083E-06
Gd-152	3.850E-16	1.171E-12	2.005E-14	5.300E-16	4.854E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.677E-12

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	2.803E-23	0.0000	0.000E+00	0.0000	2.480E-25	0.0000	1.176E-26	0.0000	2.694E-27	0.0000	5.806E-27	0.0000
Cs-137	6.172E-09	0.9592	1.469E-15	0.0000	2.246E-10	0.0349	1.733E-11	0.0027	1.076E-11	0.0017	6.738E-12	0.0010
Eu-152	2.963E-12	0.0005	2.562E-18	0.0000	7.452E-16	0.0000	1.276E-17	0.0000	8.431E-19	0.0000	5.751E-16	0.0000
Gd-152	0.000E+00	0.0000	1.051E-22	0.0000	1.352E-21	0.0000	2.316E-23	0.0000	6.120E-25	0.0000	9.158E-22	0.0000
Total	6.175E-09	0.9597	1.471E-15	0.0000	2.246E-10	0.0349	1.733E-11	0.0027	1.076E-11	0.0017	6.738E-12	0.0010

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Plant		Meat		Milk		All Pathways**	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	2.830E-23	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	6.431E-09	0.9995
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	2.965E-12	0.0005
Gd-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	2.397E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.434E-09	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 18 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 19
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	2.803E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.480E-25	0.0000	1.176E-26	0.0000	2.694E-27	0.0000	5.806E-27	0.0000
Cs-137	6.172E-09	0.9592	1.469E-15	0.0000	0.000E+00	0.0000	2.246E-10	0.0349	1.733E-11	0.0027	1.076E-11	0.0017	6.738E-12	0.0010
Eu-152	2.963E-12	0.0005	2.563E-18	0.0000	0.000E+00	0.0000	7.452E-16	0.0000	1.276E-17	0.0000	8.431E-19	0.0000	5.751E-16	0.0000
Total	6.175E-09	0.9597	1.471E-15	0.0000	0.000E+00	0.0000	2.246E-10	0.0349	1.733E-11	0.0027	1.076E-11	0.0017	6.738E-12	0.0010

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	2.830E-23	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	6.431E-09	0.9995
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	2.965E-12	0.0005
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	6.434E-09	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 19 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 20
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
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	0.000E+00	0.000E+00
Cs-137	4.650E-13	2.263E-08	1.746E-09	1.084E-09	5.863E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.604E-08
Eu-152	2.778E-25	8.451E-22	1.447E-23	9.561E-25	3.503E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.211E-21
Gd-152	3.815E-16	1.160E-12	1.987E-14	5.252E-16	4.810E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.662E-12

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
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
Cs-137	5.018E-16	0.9597	1.194E-22	0.0000	1.826E-17	0.0349	1.409E-18	0.0027	8.751E-19	0.0017	5.478E-19	0.0010
Eu-152	4.439E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Gd-152	0.000E+00	0.0000	1.041E-22	0.0000	1.340E-21	0.0000	2.295E-23	0.0000	6.064E-25	0.0000	9.074E-22	0.0000
Total	5.018E-16	0.9597	2.235E-22	0.0000	1.826E-17	0.0349	1.409E-18	0.0027	8.751E-19	0.0017	5.487E-19	0.0010

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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
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	5.229E-16	1.0000
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	4.439E-28	0.0000
Gd-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	2.375E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.229E-16	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Attachment 3 Sheet No. 20 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 3

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 21
Intrisk : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	5.018E-16	0.9597	1.194E-22	0.0000	0.000E+00	0.0000	1.826E-17	0.0349	1.409E-18	0.0027	8.751E-19	0.0017	5.478E-19	0.0010
Eu-152	4.439E-28	0.0000	1.041E-22	0.0000	0.000E+00	0.0000	1.340E-21	0.0000	2.295E-23	0.0000	6.064E-25	0.0000	9.074E-22	0.0000
Total	5.018E-16	0.9597	2.235E-22	0.0000	0.000E+00	0.0000	1.826E-17	0.0349	1.409E-18	0.0027	8.751E-19	0.0017	5.487E-19	0.0010

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	5.229E-16	1.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.375E-21	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.229E-16	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 3 Sheet No. 21 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

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1RESRAD, Version 6.3      T« Limit = 180 days       10/02/2007  14:48  Page   1
 Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
 File    : 100-F-26-14_Excavation_SZ.RAD

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             Part IV: Concentration of Radionuclides
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Concentration of radionuclides in different media

Attachment 4 Sheet No. 1 of 10
Originator: S. W. Clark [signature] Date 10/3/07
Chk'd By H. M. Sulloway [signature] Date 10/3/07
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 2
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Co-60	7.300E-02	7.300E-02	6.895E-07	0.000E+00	0.000E+00
Cs-137	2.060E-01	2.060E-01	1.946E-06	0.000E+00	0.000E+00
Eu-152	3.700E-01	3.700E-01	3.495E-06	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	5.840E+00	5.840E+00	5.840E+00	5.840E+00	8.673E+00	7.154E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	8.240E+00	8.241E+00	8.241E+00	8.241E+00	1.990E+01	4.450E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	9.252E-01	9.259E-01	9.260E-01	9.260E-01	4.959E-01	1.180E-02	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

*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 4 Sheet No. 2 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 3
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Co-60	6.399E-02	6.399E-02	6.044E-07	0.000E+00	0.000E+00
Cs-137	2.013E-01	2.013E-01	1.901E-06	0.000E+00	0.000E+00
Eu-152	3.512E-01	3.512E-01	3.318E-06	0.000E+00	0.000E+00
Gd-152	6.460E-16	6.460E-16	6.102E-21	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	5.119E+00	5.119E+00	5.157E+00	5.121E+00	7.603E+00	6.271E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	8.050E+00	8.051E+00	8.061E+00	8.051E+00	1.944E+01	4.347E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	8.783E-01	8.790E-01	8.815E-01	8.792E-01	4.708E-01	1.120E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	1.615E-15	1.617E-15	1.530E-15	1.613E-15	8.659E-16	8.272E-18	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 4 Sheet No. 3 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 4
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Co-60	4.917E-02	4.917E-02	4.644E-07	0.000E+00	0.000E+00
Cs-137	1.921E-01	1.921E-01	1.814E-06	0.000E+00	0.000E+00
Eu-152	3.165E-01	3.165E-01	2.990E-06	0.000E+00	0.000E+00
Gd-152	1.841E-15	1.841E-15	1.739E-20	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	3.934E+00	3.934E+00	3.962E+00	3.935E+00	5.842E+00	4.819E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	7.683E+00	7.684E+00	7.694E+00	7.684E+00	1.856E+01	4.149E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	7.914E-01	7.920E-01	7.944E-01	7.922E-01	4.242E-01	1.009E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.605E-15	4.608E-15	4.531E-15	4.605E-15	2.468E-15	2.351E-17	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 4 Sheet No. 4 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 5
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Concentration of radionuclides in environmental media
at t = 7.000E+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
Co-60	2.903E-02	2.903E-02	2.742E-07	0.000E+00	0.000E+00
Cs-137	1.750E-01	1.750E-01	1.653E-06	0.000E+00	0.000E+00
Eu-152	2.570E-01	2.570E-01	2.428E-06	0.000E+00	0.000E+00
Gd-152	3.889E-15	3.889E-15	3.674E-20	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 7.000E+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
Co-60	0.000E+00	2.323E+00	2.323E+00	2.340E+00	2.324E+00	3.449E+00	2.845E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	6.999E+00	6.999E+00	7.008E+00	7.000E+00	1.690E+01	3.780E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	6.427E-01	6.432E-01	6.451E-01	6.433E-01	3.445E-01	8.194E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	9.725E-15	9.733E-15	9.671E-15	9.731E-15	5.213E-15	4.962E-17	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 4 Sheet No. 5 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 6
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Concentration of radionuclides in environmental media
at t = 1.100E+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
Co-60	1.714E-02	1.714E-02	1.619E-07	0.000E+00	0.000E+00
Cs-137	1.594E-01	1.594E-01	1.506E-06	0.000E+00	0.000E+00
Eu-152	2.087E-01	2.087E-01	1.971E-06	0.000E+00	0.000E+00
Gd-152	5.552E-15	5.552E-15	5.244E-20	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.100E+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
Co-60	0.000E+00	1.371E+00	1.371E+00	1.381E+00	1.372E+00	2.037E+00	1.680E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	6.376E+00	6.376E+00	6.384E+00	6.377E+00	1.540E+01	3.443E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	5.219E-01	5.223E-01	5.238E-01	5.224E-01	2.797E-01	6.654E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	1.388E-14	1.389E-14	1.384E-14	1.389E-14	7.442E-15	7.083E-17	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 4 Sheet No. 6 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 7
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Concentration of radionuclides in environmental media
at t = 4.300E+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
Co-60	2.532E-04	2.532E-04	2.392E-09	0.000E+00	0.000E+00
Cs-137	7.557E-02	7.557E-02	7.138E-07	0.000E+00	0.000E+00
Eu-152	3.946E-02	3.946E-02	3.727E-07	0.000E+00	0.000E+00
Gd-152	1.137E-14	1.137E-14	1.074E-19	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 4.300E+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
Co-60	0.000E+00	2.026E-02	2.026E-02	2.041E-02	2.027E-02	3.009E-02	2.482E-03	0.000E+00	0.000E+00
Cs-137	0.000E+00	3.023E+00	3.023E+00	3.027E+00	3.023E+00	7.301E+00	1.632E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	9.866E-02	9.874E-02	9.903E-02	9.876E-02	5.289E-02	1.258E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	2.844E-14	2.846E-14	2.846E-14	2.847E-14	1.525E-14	1.451E-16	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 4 Sheet No. 7 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 8
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.RAD

Concentration of radionuclides in environmental media
at t = 1.350E+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
Co-60	1.383E-09	1.383E-09	1.306E-14	0.000E+00	0.000E+00
Cs-137	8.842E-03	8.842E-03	8.351E-08	0.000E+00	0.000E+00
Eu-152	3.283E-04	3.283E-04	3.101E-09	0.000E+00	0.000E+00
Gd-152	1.271E-14	1.271E-14	1.200E-19	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.350E+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
Co-60	0.000E+00	1.106E-07	1.106E-07	1.114E-07	1.107E-07	1.643E-07	1.355E-08	0.000E+00	0.000E+00
Cs-137	0.000E+00	3.537E-01	3.537E-01	3.541E-01	3.537E-01	8.542E-01	1.910E-01	0.000E+00	0.000E+00
Eu-152	0.000E+00	8.210E-04	8.217E-04	8.241E-04	8.219E-04	4.401E-04	1.047E-05	0.000E+00	0.000E+00
Gd-152	0.000E+00	3.177E-14	3.180E-14	3.180E-14	3.180E-14	1.703E-14	1.620E-16	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 4 Sheet No. 8 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 9
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Co-60	5.034E-19	5.034E-19	4.755E-24	0.000E+00	0.000E+00
Cs-137	1.885E-04	1.885E-04	1.781E-09	0.000E+00	0.000E+00
Eu-152	6.113E-08	6.113E-08	5.774E-13	0.000E+00	0.000E+00
Gd-152	1.269E-14	1.269E-14	1.199E-19	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	4.027E-17	4.027E-17	4.057E-17	4.029E-17	5.981E-17	4.934E-18	0.000E+00	0.000E+00
Cs-137	0.000E+00	7.541E-03	7.541E-03	7.551E-03	7.542E-03	1.821E-02	4.072E-03	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.529E-07	1.530E-07	1.534E-07	1.530E-07	8.194E-08	1.949E-09	0.000E+00	0.000E+00
Gd-152	0.000E+00	3.173E-14	3.176E-14	3.176E-14	3.176E-14	1.701E-14	1.618E-16	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 4 Sheet No. 9 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 4

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 14:48 Page 10
Concent : 100-F-26:14 Excavation Shallow Zone RESRAD Calculation
File : 100-F-26-14_Excavation_SZ.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
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	1.533E-11	1.533E-11	1.448E-16	0.000E+00	0.000E+00
Eu-152	9.157E-24	9.157E-24	8.649E-29	0.000E+00	0.000E+00
Gd-152	1.257E-14	1.257E-14	1.188E-19	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
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	6.131E-10	6.131E-10	6.139E-10	6.132E-10	1.481E-09	3.311E-10	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.290E-23	2.291E-23	2.298E-23	2.292E-23	1.227E-23	2.919E-25	0.000E+00	0.000E+00
Gd-152	0.000E+00	3.144E-14	3.147E-14	3.147E-14	3.147E-14	1.685E-14	1.604E-16	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 4 Sheet No. 10 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  15:05  Page   1
 Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
 File    : 100-F-26-14_OB-BCL.RAD

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Attachment 5 Sheet No. 1 of 20
Originator: S. W. Clark Date 10/3/07
Chk'd By H. M. Sulloway Date 10/3/07
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 2
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Dose Conversion Factor (and Related) Parameter Summary
File: HEAST 2001 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Co-60	2.190E-04	2.190E-04	DCF2(1)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(2)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(3)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(5)
B-1	Ni-63	6.290E-06	6.290E-06	DCF2(6)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(7)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Co-60	2.690E-05	2.690E-05	DCF3(1)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(2)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(3)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(5)
D-1	Ni-63	5.770E-07	5.770E-07	DCF3(6)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(7)
D-34	Food transfer factors:			
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(1,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(1,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(2,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(3,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-05	5.000E-05	RTF(3,3)
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34	Ni-63 , plant/soil concentration ratio, dimensionless	5.000E-02	5.000E-02	RTF(6,1)
D-34	Ni-63 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Ni-63 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-02	2.000E-02	RTF(6,3)
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(7,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(7,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(1,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(2,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(3,2)

Attachment 5 Sheet No. 2 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 3
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: HEAST 2001 MORBIDITY

Menu	Parameter	Current Value	Base Case*	Parameter Name
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(5,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Ni-63 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Ni-63 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(6,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(7,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment 5 Sheet No. 3 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 4
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	7.890E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	4.600E+00	2.000E+00	---	THICKO
R011	Length parallel to aquifer flow (m)	4.000E+01	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)	7.000E+00	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.100E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	4.300E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.350E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	1.790E-01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.430E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.070E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ni-63	7.040E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Sr-90	3.040E-01	0.000E+00	---	S1(7)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ni-63	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(7)
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)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	1.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	3.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.100E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	1.500E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.530E+03	1.000E+02	---	HCSZ

Attachment 5 Sheet No. 4 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

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Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone hydraulic gradient	1.250E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.050E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	4.600E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	7.800E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.600E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.500E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	1.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.050E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.000E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.166E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	4.600E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.166E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	2.000E+02	-1.000E+00	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.426E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Ni-63				
R016	Contaminated zone (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	3.000E+01	1.000E+03	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.605E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	2.500E+01	3.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.323E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)

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Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 6
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Site-Specific Parameter Summary (continued)

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(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.316E-05	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
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

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Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 7
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Site-Specific Parameter Summary (continued)

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	0.395E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.394E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.394E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
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
C14	DCF correction factor for gaseous forms of C14	not used	0.000E+00	---	CO2F

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Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Site-Specific Parameter Summary (continued)

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	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	5	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Attachment 5 Sheet No. 8 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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 Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
 File    : 100-F-26-14_OB-BCL.RAD

      Contaminated Zone Dimensions           Initial Soil Concentrations, pCi/g
      ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ           ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
        Area:     789.00 square meters              Co-60      1.790E-01
   Thickness:       4.60 meters                    Cs-137     1.430E+00
 Cover Depth:       0.00 meters                    Eu-152     1.070E+00
                                                   Ni-63      7.040E+00
                                                   Sr-90      3.040E-01
0
                                        Total Dose TDOSE(t), mrem/yr
                                   Basic Radiation Dose Limit = 1.500E+01 mrem/yr
                    Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)
                    ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
    t (years):  0.000E+00  1.000E+00  3.000E+00  7.000E+00  1.100E+01  4.300E+01  1.350E+02  3.000E+02  1.000E+03
     TDOSE(t):  1.003E+01  9.498E+00  8.546E+00  7.017E+00  5.854E+00  1.850E+00  1.639E-01  4.324E-03  5.292E-06
         M(t):  6.689E-01  6.332E-01  5.698E-01  4.678E-01  3.902E-01  1.234E-01  1.092E-02  2.882E-04  3.528E-07
0Maximum TDOSE(t):  1.003E+01 mrem/yr   at t = 0.000E+00 years
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Attachment 5 Sheet No. 9 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 10
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
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.
Co-60	1.752E+00	0.1746	1.213E-06	0.0000	0.000E+00	0.0000	1.713E-02	0.0017	8.124E-04	0.0001	1.862E-04	0.0000	2.219E-04	0.0000
Cs-137	2.922E+00	0.2912	1.412E-06	0.0000	0.000E+00	0.0000	1.272E-01	0.0127	9.810E-03	0.0010	6.093E-03	0.0006	3.295E-03	0.0003
Eu-152	4.540E+00	0.4524	7.317E-06	0.0000	0.000E+00	0.0000	7.708E-04	0.0001	1.320E-05	0.0000	8.721E-07	0.0000	3.195E-04	0.0000
Ni-63	0.000E+00	0.0000	1.370E-06	0.0000	0.000E+00	0.0000	9.030E-03	0.0009	1.125E-04	0.0000	1.042E-03	0.0001	1.872E-04	0.0000
Sr-90	4.513E-03	0.0004	1.231E-05	0.0000	0.000E+00	0.0000	6.196E-01	0.0618	1.103E-02	0.0011	6.231E-03	0.0006	2.140E-03	0.0002
Total	9.218E+00	0.9188	2.362E-05	0.0000	0.000E+00	0.0000	7.737E-01	0.0771	2.178E-02	0.0022	1.355E-02	0.0014	6.163E-03	0.0006

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
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.
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	1.770E+00	0.1764
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	3.068E+00	0.3058
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	4.541E+00	0.4526
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.037E-02	0.0010
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.435E-01	0.0641
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	1.003E+01	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 10 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 11
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	1.536E+00	0.1617	1.063E-06	0.0000	0.000E+00	0.0000	1.501E-02	0.0016	7.122E-04	0.0001	1.632E-04	0.0000	1.945E-04	0.0000
Cs-137	2.855E+00	0.3005	1.379E-06	0.0000	0.000E+00	0.0000	1.242E-01	0.0131	9.584E-03	0.0010	5.953E-03	0.0006	3.219E-03	0.0003
Eu-152	4.309E+00	0.4537	6.946E-06	0.0000	0.000E+00	0.0000	7.318E-04	0.0001	1.253E-05	0.0000	8.279E-07	0.0000	3.033E-04	0.0000
Ni-63	0.000E+00	0.0000	1.360E-06	0.0000	0.000E+00	0.0000	8.962E-03	0.0009	1.117E-04	0.0000	1.034E-03	0.0001	1.858E-04	0.0000
Sr-90	4.405E-03	0.0005	1.201E-05	0.0000	0.000E+00	0.0000	6.047E-01	0.0637	1.077E-02	0.0011	6.082E-03	0.0006	2.089E-03	0.0002
Total	8.704E+00	0.9164	2.276E-05	0.0000	0.000E+00	0.0000	7.537E-01	0.0793	2.119E-02	0.0022	1.323E-02	0.0014	5.991E-03	0.0006

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-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	1.552E+00	0.1634
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	2.998E+00	0.3156
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	4.310E+00	0.4538
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.029E-02	0.0011
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.281E-01	0.0661
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	9.498E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 11 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 12
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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+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.
Co-60	1.180E+00	0.1381	8.171E-07	0.0000	0.000E+00	0.0000	1.154E-02	0.0013	5.473E-04	0.0001	1.254E-04	0.0000	1.494E-04	0.0000
Cs-137	2.725E+00	0.3188	1.316E-06	0.0000	0.000E+00	0.0000	1.186E-01	0.0139	9.147E-03	0.0011	5.681E-03	0.0007	3.072E-03	0.0004
Eu-152	3.883E+00	0.4544	6.259E-06	0.0000	0.000E+00	0.0000	6.594E-04	0.0001	1.129E-05	0.0000	7.460E-07	0.0000	2.733E-04	0.0000
Ni-63	0.000E+00	0.0000	1.339E-06	0.0000	0.000E+00	0.0000	8.827E-03	0.0010	1.100E-04	0.0000	1.018E-03	0.0001	1.830E-04	0.0000
Sr-90	4.196E-03	0.0005	1.145E-05	0.0000	0.000E+00	0.0000	5.761E-01	0.0674	1.026E-02	0.0012	5.794E-03	0.0007	1.990E-03	0.0002
Total	7.792E+00	0.9118	2.118E-05	0.0000	0.000E+00	0.0000	7.157E-01	0.0837	2.007E-02	0.0023	1.262E-02	0.0015	5.668E-03	0.0007

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.
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	1.193E+00	0.1395
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	2.861E+00	0.3348
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	3.884E+00	0.4545
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.014E-02	0.0012
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.984E-01	0.0700
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	8.546E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 12 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 13
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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 = 7.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0 Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	6.968E-01	0.0993	4.824E-07	0.0000	0.000E+00	0.0000	6.811E-03	0.0010	3.231E-04	0.0000	7.404E-05	0.0000	8.824E-05	0.0000
Cs-137	2.482E+00	0.3537	1.199E-06	0.0000	0.000E+00	0.0000	1.080E-01	0.0154	8.332E-03	0.0012	5.175E-03	0.0007	2.798E-03	0.0004
Eu-152	3.153E+00	0.4494	5.083E-06	0.0000	0.000E+00	0.0000	5.355E-04	0.0001	9.168E-06	0.0000	6.058E-07	0.0000	2.219E-04	0.0000
Ni-63	0.000E+00	0.0000	1.299E-06	0.0000	0.000E+00	0.0000	8.564E-03	0.0012	1.067E-04	0.0000	9.879E-04	0.0001	1.775E-04	0.0000
Sr-90	3.808E-03	0.0005	1.039E-05	0.0000	0.000E+00	0.0000	5.229E-01	0.0745	9.310E-03	0.0013	5.259E-03	0.0007	1.806E-03	0.0003
Total	6.336E+00	0.9029	1.845E-05	0.0000	0.000E+00	0.0000	6.468E-01	0.0922	1.808E-02	0.0026	1.150E-02	0.0016	5.092E-03	0.0007

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+00 years

0 Water Dependent Pathways

0 Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	7.041E-01	0.1003
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	2.606E+00	0.3714
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	3.154E+00	0.4495
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.837E-03	0.0014
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.431E-01	0.0774
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	7.017E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 13 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 14
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	4.114E-01	0.0703	2.849E-07	0.0000	0.000E+00	0.0000	4.022E-03	0.0007	1.908E-04	0.0000	4.372E-05	0.0000	5.210E-05	0.0000
Cs-137	2.261E+00	0.3862	1.092E-06	0.0000	0.000E+00	0.0000	9.839E-02	0.0168	7.590E-03	0.0013	4.714E-03	0.0008	2.549E-03	0.0004
Eu-152	2.561E+00	0.4374	4.128E-06	0.0000	0.000E+00	0.0000	4.348E-04	0.0001	7.445E-06	0.0000	4.919E-07	0.0000	1.802E-04	0.0000
Ni-63	0.000E+00	0.0000	1.261E-06	0.0000	0.000E+00	0.0000	8.308E-03	0.0014	1.035E-04	0.0000	9.584E-04	0.0002	1.722E-04	0.0000
Sr-90	3.457E-03	0.0006	9.428E-06	0.0000	0.000E+00	0.0000	4.746E-01	0.0811	8.450E-03	0.0014	4.773E-03	0.0008	1.639E-03	0.0003
Total	5.236E+00	0.8946	1.619E-05	0.0000	0.000E+00	0.0000	5.857E-01	0.1001	1.634E-02	0.0028	1.049E-02	0.0018	4.593E-03	0.0008

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.100E+01 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	4.157E-01	0.0710
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	2.374E+00	0.4056
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	2.561E+00	0.4376
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.543E-03	0.0016
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.929E-01	0.0842
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.854E+00	1.0000

*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 14 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 15
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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 = 4.300E+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.
Co-60	6.078E-03	0.0033	4.208E-09	0.0000	0.000E+00	0.0000	5.941E-05	0.0000	2.818E-06	0.0000	6.458E-07	0.0000	7.696E-07	0.0000
Cs-137	1.072E+00	0.5793	5.178E-07	0.0000	0.000E+00	0.0000	4.665E-02	0.0252	3.599E-03	0.0019	2.235E-03	0.0012	1.209E-03	0.0007
Eu-152	4.841E-01	0.2616	7.803E-07	0.0000	0.000E+00	0.0000	8.220E-05	0.0000	1.408E-06	0.0000	9.300E-08	0.0000	3.407E-05	0.0000
Ni-63	0.000E+00	0.0000	9.891E-07	0.0000	0.000E+00	0.0000	6.518E-03	0.0035	8.121E-05	0.0000	7.519E-04	0.0004	1.351E-04	0.0001
Sr-90	1.592E-03	0.0009	4.341E-06	0.0000	0.000E+00	0.0000	2.185E-01	0.1181	3.891E-03	0.0021	2.198E-03	0.0012	7.549E-04	0.0004
Total	1.564E+00	0.8450	6.633E-06	0.0000	0.000E+00	0.0000	2.718E-01	0.1469	7.575E-03	0.0041	5.186E-03	0.0028	2.133E-03	0.0012

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 = 4.300E+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.
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	6.141E-03	0.0033
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	1.126E+00	0.6083
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	4.842E-01	0.2617
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.487E-03	0.0040
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.270E-01	0.1227
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	1.850E+00	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 15 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 16
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.350E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	3.318E-08	0.0000	2.297E-14	0.0000	0.000E+00	0.0000	3.244E-10	0.0000	1.539E-11	0.0000	3.526E-12	0.0000	4.202E-12	0.0000
Cs-137	1.254E-01	0.7653	6.059E-08	0.0000	0.000E+00	0.0000	5.458E-03	0.0333	4.211E-04	0.0026	2.615E-04	0.0016	1.414E-04	0.0009
Eu-152	4.029E-03	0.0246	6.494E-09	0.0000	0.000E+00	0.0000	6.841E-07	0.0000	1.171E-08	0.0000	7.739E-10	0.0000	2.835E-07	0.0000
Ni-63	0.000E+00	0.0000	4.924E-07	0.0000	0.000E+00	0.0000	3.245E-03	0.0198	4.043E-05	0.0002	3.744E-04	0.0023	6.726E-05	0.0004
Sr-90	1.712E-04	0.0010	4.670E-07	0.0000	0.000E+00	0.0000	2.351E-02	0.1434	4.185E-04	0.0026	2.364E-04	0.0014	8.120E-05	0.0005
Total	1.296E-01	0.7910	1.026E-06	0.0000	0.000E+00	0.0000	3.221E-02	0.1966	8.800E-04	0.0054	8.723E-04	0.0053	2.902E-04	0.0018

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.350E+02 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.353E-08	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	1.317E-01	0.8037
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	4.030E-03	0.0246
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.728E-03	0.0227
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.441E-02	0.1490
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	1.639E-01	1.0000

*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 16 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 17
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Co-60	1.208E-17	0.0000	8.365E-24	0.0000	0.000E+00	0.0000	1.181E-19	0.0000	5.603E-21	0.0000	1.284E-21	0.0000	1.530E-21	0.0000
Cs-137	2.674E-03	0.6185	1.292E-09	0.0000	0.000E+00	0.0000	1.164E-04	0.0269	8.977E-06	0.0021	5.576E-06	0.0013	3.015E-06	0.0007
Eu-152	7.500E-07	0.0002	1.209E-12	0.0000	0.000E+00	0.0000	1.274E-10	0.0000	2.181E-12	0.0000	1.441E-13	0.0000	5.279E-11	0.0000
Ni-63	0.000E+00	0.0000	1.410E-07	0.0000	0.000E+00	0.0000	9.290E-04	0.2149	1.157E-05	0.0027	1.072E-04	0.0248	1.926E-05	0.0045
Sr-90	3.139E-06	0.0007	8.563E-09	0.0000	0.000E+00	0.0000	4.310E-04	0.0997	7.674E-06	0.0018	4.335E-06	0.0010	1.489E-06	0.0003
Total	2.678E-03	0.6194	1.508E-07	0.0000	0.000E+00	0.0000	1.476E-03	0.3415	2.823E-05	0.0065	1.171E-04	0.0271	2.376E-05	0.0055

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
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	1.221E-17	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	2.808E-03	0.6495
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	7.502E-07	0.0002
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.067E-03	0.2468
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.477E-04	0.1035
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.324E-03	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 17 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 18
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.174E-10	0.0000	1.050E-16	0.0000	0.000E+00	0.0000	9.461E-12	0.0000	7.299E-13	0.0000	4.533E-13	0.0000	2.451E-13	0.0000
Eu-152	1.123E-22	0.0000	2.734E-16	0.0000	0.000E+00	0.0000	6.509E-16	0.0000	1.114E-17	0.0000	2.945E-19	0.0000	2.698E-16	0.0000
Ni-63	0.000E+00	0.0000	6.991E-10	0.0001	0.000E+00	0.0000	4.607E-06	0.8705	5.740E-08	0.0108	5.314E-07	0.1004	9.549E-08	0.0180
Sr-90	1.346E-13	0.0000	3.672E-16	0.0000	0.000E+00	0.0000	1.848E-11	0.0000	3.291E-13	0.0000	1.859E-13	0.0000	6.385E-14	0.0000
Total	2.175E-10	0.0000	6.991E-10	0.0001	0.000E+00	0.0000	4.607E-06	0.8705	5.740E-08	0.0108	5.314E-07	0.1004	9.549E-08	0.0180

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 = 1.000E+03 years

0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.283E-10	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	1.205E-15	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.292E-06	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.920E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.292E-06	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 5 Sheet No. 18 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

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1RESRAD, Version 6.3      T« Limit = 180 days        10/02/2007  15:05  Page  19
 Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
 File    : 100-F-26-14_OB-BCL.RAD

                                  Dose/Source Ratios Summed Over All Pathways
                            Parent and Progeny Principal Radionuclide Contributions Indicated
0  Parent    Product    Thread                        DSR(j,t) At Time in Years   (mrem/yr)/(pCi/g)
    (i)        (j)     Fraction   0.000E+00 1.000E+00 3.000E+00 7.000E+00 1.100E+01 4.300E+01 1.350E+02 3.000E+02 1.000E+03
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 Co-60      Co-60      1.000E+00 9.891E+00 8.670E+00 6.662E+00 3.934E+00 2.323E+00 3.431E-02 1.873E-07 6.820E-17 0.000E+00
0Cs-137+D   Cs-137+D   1.000E+00 2.146E+00 2.096E+00 2.001E+00 1.823E+00 1.660E+00 7.872E-01 9.210E-02 1.964E-03 1.596E-10
0Eu-152     Eu-152     7.208E-01 3.059E+00 2.904E+00 2.617E+00 2.125E+00 1.725E+00 3.262E-01 2.714E-03 5.054E-07 7.570E-23
0Eu-152     Eu-152     2.792E-01 1.185E+00 1.125E+00 1.014E+00 8.230E-01 6.683E-01 1.264E-01 1.051E-03 1.958E-07 2.932E-23
 Eu-152     Gd-152     2.792E-01 0.000E+00 5.789E-17 1.650E-16 3.485E-16 4.975E-16 1.019E-15 1.138E-15 1.137E-15 1.127E-15
 Eu-152     äDSR(j)               1.185E+00 1.125E+00 1.014E+00 8.230E-01 6.683E-01 1.264E-01 1.051E-03 1.958E-07 1.127E-15
0Ni-63      Ni-63      1.000E+00 1.473E-03 1.462E-03 1.440E-03 1.397E-03 1.356E-03 1.064E-03 5.295E-04 1.516E-04 7.517E-07
0Sr-90+D    Sr-90+D    1.000E+00 2.117E+00 2.066E+00 1.968E+00 1.786E+00 1.621E+00 7.466E-01 8.031E-02 1.473E-03 6.315E-11
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 The DSR includes contributions from associated (half-life ó 180 days) daughters.
0

                                  Single Radionuclide Soil Guidelines G(i,t) in pCi/g
                                     Basic Radiation Dose Limit = 1.500E+01 mrem/yr
ONuclide
   (i)    t= 0.000E+00   1.000E+00   3.000E+00   7.000E+00   1.100E+01   4.300E+01   1.350E+02   3.000E+02   1.000E+03
 ÄÄÄÄÄÄÄ    ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ
 Co-60       1.517E+00  1.730E+00  2.252E+00  3.813E+00  6.458E+00  4.372E+02  8.008E+07  *1.132E+15  *1.132E+15
 Cs-137      6.990E+00  7.155E+00  7.497E+00  8.230E+00  9.035E+00  1.906E+01  1.629E+02  7.639E+03   9.396E+10
 Eu-152      3.535E+00  3.724E+00  4.132E+00  5.089E+00  6.266E+00  3.315E+01  3.983E+03  2.139E+07  *1.765E+14
 Ni-63       1.018E+04  1.026E+04  1.041E+04  1.074E+04  1.107E+04  1.410E+04  2.833E+04  9.896E+04   1.996E+07
 Sr-90       7.086E+00  7.260E+00  7.621E+00  8.396E+00  9.251E+00  2.009E+01  1.868E+02  1.019E+04   2.375E+11
 ÍÍÍÍÍÍÍ    ÍÍÍÍÍÍÍÍÍ  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  Initial        tmin       DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)
   (i)    (pCi/g)      (years)                   (pCi/g)               (pCi/g)
 ÄÄÄÄÄÄÄ ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ  ÄÄÄÄÄÄÄÄÄÄ
 Co-60   1.790E-01     0.000E+00      9.891E+00  1.517E+00  9.891E+00  1.517E+00
 Cs-137  1.430E+00     0.000E+00      2.146E+00  6.990E+00  2.146E+00  6.990E+00
 Eu-152  1.070E+00     0.000E+00      4.244E+00  3.535E+00  4.244E+00  3.535E+00
 Ni-63   7.040E+00     0.000E+00      1.473E-03  1.018E+04  1.473E-03  1.018E+04
 Sr-90   3.040E-01     0.000E+00      2.117E+00  7.086E+00  2.117E+00  7.086E+00
 ÍÍÍÍÍÍÍ ÍÍÍÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍ  ÍÍÍÍÍÍÍÍÍ
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Attachment 5 Sheet No. 19 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 5

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 20
Summary : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

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	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.770E+00	1.552E+00	1.193E+00	7.041E-01	4.157E-01	6.141E-03	3.353E-08	1.221E-17	0.000E+00
OCs-137	Cs-137	1.000E+00	3.068E+00	2.998E+00	2.861E+00	2.606E+00	2.374E+00	1.126E+00	1.317E-01	2.808E-03	2.283E-10
OEu-152	Eu-152	7.208E-01	3.273E+00	3.107E+00	2.800E+00	2.274E+00	1.846E+00	3.490E-01	2.904E-03	5.408E-07	8.100E-23
Eu-152	Eu-152	2.792E-01	1.268E+00	1.203E+00	1.084E+00	8.806E-01	7.151E-01	1.352E-01	1.125E-03	2.095E-07	3.137E-23
Eu-152	äDOSE(j)		4.541E+00	4.310E+00	3.884E+00	3.154E+00	2.561E+00	4.842E-01	4.030E-03	7.502E-07	1.124E-22
OGd-152	Eu-152	2.792E-01	0.000E+00	6.194E-17	1.765E-16	3.729E-16	5.323E-16	1.090E-15	1.218E-15	1.217E-15	1.205E-15
ONi-63	Ni-63	1.000E+00	1.037E-02	1.029E-02	1.014E-02	9.837E-03	9.543E-03	7.487E-03	3.728E-03	1.067E-03	5.292E-06
OSr-90	Sr-90	1.000E+00	6.435E-01	6.281E-01	5.984E-01	5.431E-01	4.929E-01	2.270E-01	2.441E-02	4.477E-04	1.920E-11

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.790E-01	1.569E-01	1.206E-01	7.119E-02	4.203E-02	6.209E-04	3.390E-09	1.234E-18	0.000E+00
OCs-137	Cs-137	1.000E+00	1.430E+00	1.397E+00	1.333E+00	1.215E+00	1.106E+00	5.246E-01	6.138E-02	1.309E-03	1.064E-10
OEu-152	Eu-152	7.208E-01	7.713E-01	7.321E-01	6.597E-01	5.357E-01	4.350E-01	8.225E-02	6.844E-04	1.274E-07	1.909E-23
Eu-152	Eu-152	2.792E-01	2.987E-01	2.836E-01	2.556E-01	2.075E-01	1.685E-01	3.186E-02	2.651E-04	4.936E-08	7.393E-24
Eu-152	äS(j):		1.070E+00	1.016E+00	9.153E-01	7.433E-01	6.035E-01	1.141E-01	9.495E-04	1.768E-07	2.648E-23
OGd-152	Eu-152	2.792E-01	0.000E+00	1.868E-15	5.325E-15	1.125E-14	1.606E-14	3.289E-14	3.675E-14	3.670E-14	3.636E-14
ONi-63	Ni-63	1.000E+00	7.040E+00	6.987E+00	6.882E+00	6.676E+00	6.477E+00	5.082E+00	2.530E+00	7.242E-01	3.592E-03
OSr-90	Sr-90	1.000E+00	3.040E-01	2.967E-01	2.827E-01	2.566E-01	2.329E-01	1.072E-01	1.153E-02	2.115E-04	9.069E-12

THF(i) is the thread fraction of the parent nuclide.
ORESCALC.EXE execution time = 5.91 seconds

Attachment 5 Sheet No. 20 of 20
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 1
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Table of Contents

Part III: Intake Quantities and Health Risk Factors

Attachment 6 Sheet No. 1 of 21
Originator: S. W. Clark Date 10/3/07
Chk'd By H. M. Sulloway Date 10/3/07
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 2
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Cancer Risk Slope Factors Summary Table
Risk Library: HEAST 2001 Morbidity

Menu	Parameter	Current Value	Base Case*	Parameter Name
Sf-1	Ground external radiation slope factors, 1/yr per (pCi/g):			
Sf-1	Co-60	1.24E-05	1.24E-05	SLPF(1,1)
Sf-1	Cs-137+D	2.55E-06	5.32E-10	SLPF(2,1)
Sf-1	Eu-152	5.30E-06	5.30E-06	SLPF(3,1)
Sf-1	Gd-152	0.00E+00	0.00E+00	SLPF(5,1)
Sf-1	Ni-63	0.00E+00	0.00E+00	SLPF(6,1)
Sf-1	Sr-90+D	1.96E-08	4.82E-10	SLPF(7,1)
Sf-2	Inhalation, slope factors, 1/(pCi):			
Sf-2	Co-60	3.58E-11	3.58E-11	SLPF(1,2)
Sf-2	Cs-137+D	1.19E-11	1.19E-11	SLPF(2,2)
Sf-2	Eu-152	9.10E-11	9.10E-11	SLPF(3,2)
Sf-2	Gd-152	9.10E-09	9.10E-09	SLPF(5,2)
Sf-2	Ni-63	5.77E-12	5.77E-12	SLPF(6,2)
Sf-2	Sr-90+D	1.13E-10	1.05E-10	SLPF(7,2)
Sf-3	Food ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	2.23E-11	2.23E-11	SLPF(1,3)
Sf-3	Cs-137+D	3.74E-11	3.74E-11	SLPF(2,3)
Sf-3	Eu-152	8.70E-12	8.70E-12	SLPF(3,3)
Sf-3	Gd-152	3.85E-11	3.85E-11	SLPF(5,3)
Sf-3	Ni-63	9.51E-13	9.51E-13	SLPF(6,3)
Sf-3	Sr-90+D	9.53E-11	6.88E-11	SLPF(7,3)
Sf-3	Water ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	1.57E-11	1.57E-11	SLPF(1,4)
Sf-3	Cs-137+D	3.04E-11	3.04E-11	SLPF(2,4)
Sf-3	Eu-152	6.07E-12	6.07E-12	SLPF(3,4)
Sf-3	Gd-152	2.97E-11	2.97E-11	SLPF(5,4)
Sf-3	Ni-63	6.70E-13	6.70E-13	SLPF(6,4)
Sf-3	Sr-90+D	7.40E-11	5.59E-11	SLPF(7,4)
Sf-3	Soil ingestion, slope factors, 1/(pCi):			
Sf-3	Co-60	4.03E-11	4.03E-11	SLPF(1,5)
Sf-3	Cs-137+D	4.33E-11	4.33E-11	SLPF(2,5)
Sf-3	Eu-152	1.62E-11	1.62E-11	SLPF(3,5)
Sf-3	Gd-152	6.29E-11	6.29E-11	SLPF(5,5)
Sf-3	Ni-63	1.79E-12	1.79E-12	SLPF(6,5)
Sf-3	Sr-90+D	1.44E-10	9.18E-11	SLPF(7,5)

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment 6 Sheet No. 2 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 3
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Risk Slope and Environmental Transport Factors for the Ground Pathway

ONuclide (i)	Slope(i)*	ETFG(i,t) At Time in Years (dimensionless)								
	t=	0.000E+00	1.000E+00	3.000E+00	7.000E+00	1.100E+01	4.300E+01	1.350E+02	3.000E+02	1.000E+03
Ba-137m	2.690E-06	5.990E-01	5.990E-01	5.990E-01	5.990E-01	5.990E-01	5.990E-01	5.990E-01	5.990E-01	5.990E-01
Co-60	1.240E-05	6.037E-01	6.037E-01	6.037E-01	6.037E-01	6.037E-01	6.037E-01	6.037E-01	6.037E-01	6.037E-01
Cs-137	5.320E-10	6.171E-01	6.171E-01	6.171E-01	6.171E-01	6.171E-01	6.171E-01	6.171E-01	6.171E-01	6.171E-01
Eu-152	5.300E-06	6.057E-01	6.057E-01	6.057E-01	6.057E-01	6.057E-01	6.057E-01	6.057E-01	6.057E-01	6.057E-01
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	0.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90	4.820E-10	6.196E-01	6.196E-01	6.196E-01	6.196E-01	6.196E-01	6.196E-01	6.196E-01	6.196E-01	6.196E-01
Y-90	1.910E-08	6.026E-01	6.026E-01	6.026E-01	6.026E-01	6.026E-01	6.026E-01	6.026E-01	6.026E-01	6.026E-01

* - Units are 1/yr per (pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Attachment 6 Sheet No. 3 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 4
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 0.000E+00 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio-Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	5.539E-03	6.367E+02	3.020E+01	6.921E+00	8.248E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.820E+02
Cs-137	4.425E-02	2.543E+03	1.962E+02	1.219E+02	6.589E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.927E+03
Eu-152	3.311E-02	1.190E+02	2.037E+00	1.346E-01	4.930E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.704E+02
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	0.000E+00	0.000E+00
Ni-63	2.178E-01	1.565E+04	1.950E+02	1.805E+03	3.244E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.797E+04
Sr-90	9.407E-03	4.055E+03	7.219E+01	4.078E+01	1.401E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.182E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	1.002E-05	0.0830	1.484E-12	0.0000	1.062E-07	0.0009	5.039E-09	0.0000	1.155E-09	0.0000	2.487E-09	0.0000
Cs-137	4.705E-05	0.3895	1.136E-11	0.0000	2.052E-06	0.0170	1.583E-07	0.0013	9.835E-08	0.0008	6.156E-08	0.0005
Eu-152	5.215E-05	0.4317	4.575E-11	0.0000	1.571E-08	0.0001	2.690E-10	0.0000	1.778E-11	0.0000	1.213E-08	0.0001
Gd-152	0.000E+00	0.0000	1.537E-22	0.0000	2.336E-21	0.0000	3.999E-23	0.0000	1.057E-24	0.0000	1.582E-21	0.0000
Ni-63	0.000E+00	0.0000	3.373E-11	0.0000	3.994E-07	0.0033	4.976E-09	0.0000	4.607E-08	0.0004	1.558E-08	0.0001
Sr-90	7.653E-08	0.0006	2.274E-11	0.0000	8.238E-06	0.0682	1.467E-07	0.0012	8.285E-08	0.0007	4.309E-08	0.0004
Total	1.093E-04	0.9049	1.151E-10	0.0000	1.081E-05	0.0895	3.153E-07	0.0026	2.284E-07	0.0019	1.349E-07	0.0011

Attachment 6 Sheet No. 4 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 5
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	1.014E-05	0.0839
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	4.942E-05	0.4091
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	5.218E-05	0.4320
Gd-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	4.112E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.660E-07	0.0039
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.587E-06	0.0711
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	1.208E-04	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways
0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	1.002E-05	0.0830	1.484E-12	0.0000	0.000E+00	0.0000	1.062E-07	0.0009	5.039E-09	0.0000	1.155E-09	0.0000	2.487E-09	0.0000
Cs-137	4.705E-05	0.3895	1.136E-11	0.0000	0.000E+00	0.0000	2.052E-06	0.0170	1.583E-07	0.0013	9.835E-08	0.0008	6.156E-08	0.0005
Eu-152	5.215E-05	0.4317	4.575E-11	0.0000	0.000E+00	0.0000	1.571E-08	0.0001	2.690E-10	0.0000	1.778E-11	0.0000	1.213E-08	0.0001
Ni-63	0.000E+00	0.0000	3.373E-11	0.0000	0.000E+00	0.0000	3.994E-07	0.0033	4.976E-09	0.0000	4.607E-08	0.0004	1.558E-08	0.0001
Sr-90	7.653E-08	0.0006	2.274E-11	0.0000	0.000E+00	0.0000	8.238E-06	0.0682	1.467E-07	0.0012	8.285E-08	0.0007	4.309E-08	0.0004
Total	1.093E-04	0.9049	1.151E-10	0.0000	0.000E+00	0.0000	1.081E-05	0.0895	3.153E-07	0.0026	2.284E-07	0.0019	1.349E-07	0.0011

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	1.014E-05	0.0839
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	4.942E-05	0.4091
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.218E-05	0.4320
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.660E-07	0.0039
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.587E-06	0.0711
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	1.208E-04	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 5 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 6
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	4.855E-03	5.581E+02	2.648E+01	6.067E+00	7.230E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.979E+02
Cs-137	4.323E-02	2.485E+03	1.917E+02	1.191E+02	6.437E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.860E+03
Eu-152	3.143E-02	1.129E+02	1.934E+00	1.278E-01	4.680E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.618E+02
Gd-152	5.781E-17	2.077E-13	3.556E-15	9.437E-17	8.609E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.974E-13
Ni-63	2.162E-01	1.553E+04	1.935E+02	1.792E+03	3.219E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.784E+04
Sr-90	9.182E-03	3.958E+03	7.046E+01	3.980E+01	1.367E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.082E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	8.787E-06	0.0761	1.300E-12	0.0000	9.311E-08	0.0008	4.417E-09	0.0000	1.012E-09	0.0000	2.180E-09	0.0000
Cs-137	4.596E-05	0.3978	1.110E-11	0.0000	2.005E-06	0.0174	1.547E-07	0.0013	9.608E-08	0.0008	6.015E-08	0.0005
Eu-152	4.950E-05	0.4284	4.343E-11	0.0000	1.492E-08	0.0001	2.554E-10	0.0000	1.687E-11	0.0000	1.151E-08	0.0001
Gd-152	0.000E+00	0.0000	1.617E-22	0.0000	2.457E-21	0.0000	4.207E-23	0.0000	1.112E-24	0.0000	1.664E-21	0.0000
Ni-63	0.000E+00	0.0000	3.347E-11	0.0000	3.964E-07	0.0034	4.938E-09	0.0000	4.572E-08	0.0004	1.546E-08	0.0001
Sr-90	7.469E-08	0.0006	2.220E-11	0.0000	8.041E-06	0.0696	1.432E-07	0.0012	8.087E-08	0.0007	4.206E-08	0.0004
Total	1.043E-04	0.9029	1.115E-10	0.0000	1.055E-05	0.0913	3.075E-07	0.0027	2.237E-07	0.0019	1.314E-07	0.0011

Attachment 6 Sheet No. 6 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 7
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Plant		Meat		Milk		All Pathways**	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	8.888E-06	0.0769
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	4.828E-05	0.4179
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	4.953E-05	0.4287
Gd-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	4.326E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.625E-07	0.0040
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.382E-06	0.0725
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	1.155E-04	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways
0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)
0

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	8.787E-06	0.0761	1.300E-12	0.0000	0.000E+00	0.0000	9.311E-08	0.0008	4.417E-09	0.0000	1.012E-09	0.0000	2.180E-09	0.0000
Cs-137	4.596E-05	0.3978	1.110E-11	0.0000	0.000E+00	0.0000	2.005E-06	0.0174	1.547E-07	0.0013	9.608E-08	0.0008	6.015E-08	0.0005
Eu-152	4.950E-05	0.4284	4.343E-11	0.0000	0.000E+00	0.0000	1.492E-08	0.0001	2.554E-10	0.0000	1.687E-11	0.0000	1.151E-08	0.0001
Ni-63	0.000E+00	0.0000	3.347E-11	0.0000	0.000E+00	0.0000	3.964E-07	0.0034	4.938E-09	0.0000	4.572E-08	0.0004	1.546E-08	0.0001
Sr-90	7.469E-08	0.0006	2.220E-11	0.0000	0.000E+00	0.0000	8.041E-06	0.0696	1.432E-07	0.0012	8.087E-08	0.0007	4.206E-08	0.0004
Total	1.043E-04	0.9029	1.115E-10	0.0000	0.000E+00	0.0000	1.055E-05	0.0913	3.075E-07	0.0027	2.237E-07	0.0019	1.314E-07	0.0011

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	8.888E-06	0.0769
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	4.828E-05	0.4179
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	4.953E-05	0.4287
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.625E-07	0.0040
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.382E-06	0.0725
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	1.155E-04	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 7 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 8
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+00 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	3.731E-03	4.289E+02	2.034E+01	4.662E+00	5.556E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.594E+02
Cs-137	4.126E-02	2.371E+03	1.829E+02	1.136E+02	6.144E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.729E+03
Eu-152	2.832E-02	1.018E+02	1.742E+00	1.151E-01	4.217E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.458E+02
Gd-152	1.648E-16	5.920E-13	1.014E-14	2.683E-16	2.454E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.478E-13
Ni-63	2.130E-01	1.530E+04	1.906E+02	1.765E+03	3.171E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.757E+04
Sr-90	8.747E-03	3.770E+03	6.713E+01	3.792E+01	1.303E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.889E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Plant		Meat		Milk		Soil	
	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	6.752E-06	0.0637	9.993E-13	0.0000	7.155E-08	0.0007	3.394E-09	0.0000	7.777E-10	0.0000	1.675E-09	0.0000
Cs-137	4.387E-05	0.4139	1.059E-11	0.0000	1.914E-06	0.0181	1.476E-07	0.0014	9.170E-08	0.0009	5.740E-08	0.0005
Eu-152	4.461E-05	0.4209	3.913E-11	0.0000	1.344E-08	0.0001	2.301E-10	0.0000	1.521E-11	0.0000	1.037E-08	0.0001
Gd-152	0.000E+00	0.0000	1.764E-22	0.0000	2.682E-21	0.0000	4.592E-23	0.0000	1.214E-24	0.0000	1.816E-21	0.0000
Ni-63	0.000E+00	0.0000	3.297E-11	0.0000	3.904E-07	0.0037	4.864E-09	0.0000	4.503E-08	0.0004	1.523E-08	0.0001
Sr-90	7.116E-08	0.0007	2.115E-11	0.0000	7.661E-06	0.0723	1.364E-07	0.0013	7.704E-08	0.0007	4.007E-08	0.0004
Total	9.530E-05	0.8992	1.048E-10	0.0000	1.005E-05	0.0948	2.925E-07	0.0028	2.146E-07	0.0020	1.248E-07	0.0012

Attachment 6 Sheet No. 8 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 9
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Plant		Meat		Milk		All Pathways**	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	6.829E-06	0.0644
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	4.608E-05	0.4348
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	4.463E-05	0.4211
Gd-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	4.721E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.556E-07	0.0043
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.985E-06	0.0753
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	1.060E-04	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	6.752E-06	0.0637	9.993E-13	0.0000	0.000E+00	0.0000	7.155E-08	0.0007	3.394E-09	0.0000	7.777E-10	0.0000	1.675E-09	0.0000
Cs-137	4.387E-05	0.4139	1.059E-11	0.0000	0.000E+00	0.0000	1.914E-06	0.0181	1.476E-07	0.0014	9.170E-08	0.0009	5.740E-08	0.0005
Eu-152	4.461E-05	0.4209	3.913E-11	0.0000	0.000E+00	0.0000	1.344E-08	0.0001	2.301E-10	0.0000	1.521E-11	0.0000	1.037E-08	0.0001
Ni-63	0.000E+00	0.0000	3.297E-11	0.0000	0.000E+00	0.0000	3.904E-07	0.0037	4.864E-09	0.0000	4.503E-08	0.0004	1.523E-08	0.0001
Sr-90	7.116E-08	0.0007	2.115E-11	0.0000	0.000E+00	0.0000	7.661E-06	0.0723	1.364E-07	0.0013	7.704E-08	0.0007	4.007E-08	0.0004
Total	9.530E-05	0.8992	1.048E-10	0.0000	0.000E+00	0.0000	1.005E-05	0.0948	2.925E-07	0.0028	2.146E-07	0.0020	1.248E-07	0.0012

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All pathways	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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	6.829E-06	0.0644
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	4.608E-05	0.4348
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	4.463E-05	0.4211
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.556E-07	0.0043
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.985E-06	0.0753
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	1.060E-04	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 9 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 10
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 7.000E+00 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	2.203E-03	2.532E+02	1.201E+01	2.752E+00	3.280E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.713E+02
Cs-137	3.759E-02	2.160E+03	1.666E+02	1.035E+02	5.597E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.486E+03
Eu-152	2.300E-02	8.263E+01	1.415E+00	9.348E-02	3.425E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.184E+02
Gd-152	3.480E-16	1.250E-12	2.141E-14	5.661E-16	5.183E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.791E-12
Ni-63	2.066E-01	1.484E+04	1.849E+02	1.712E+03	3.076E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.705E+04
Sr-90	7.939E-03	3.422E+03	6.093E+01	3.442E+01	1.182E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.529E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	3.987E-06	0.0443	5.900E-13	0.0000	4.224E-08	0.0005	2.004E-09	0.0000	4.592E-10	0.0000	9.890E-10	0.0000
Cs-137	3.996E-05	0.4443	9.651E-12	0.0000	1.743E-06	0.0194	1.345E-07	0.0015	8.353E-08	0.0009	5.229E-08	0.0006
Eu-152	3.622E-05	0.4028	3.178E-11	0.0000	1.091E-08	0.0001	1.869E-10	0.0000	1.235E-11	0.0000	8.423E-09	0.0001
Gd-152	0.000E+00	0.0000	2.017E-22	0.0000	3.067E-21	0.0000	5.251E-23	0.0000	1.388E-24	0.0000	2.076E-21	0.0000
Ni-63	0.000E+00	0.0000	3.199E-11	0.0000	3.787E-07	0.0042	4.719E-09	0.0001	4.369E-08	0.0005	1.478E-08	0.0002
Sr-90	6.458E-08	0.0007	1.919E-11	0.0000	6.953E-06	0.0773	1.238E-07	0.0014	6.992E-08	0.0008	3.637E-08	0.0004
Total	8.023E-05	0.8921	9.320E-11	0.0000	9.128E-06	0.1015	2.652E-07	0.0029	1.976E-07	0.0022	1.128E-07	0.0013

Attachment 6 Sheet No. 10 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 11
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	4.032E-06	0.0448
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	4.197E-05	0.4667
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	3.624E-05	0.4030
Gd-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	5.399E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.419E-07	0.0049
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.247E-06	0.0806
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	8.994E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways
0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	3.987E-06	0.0443	5.900E-13	0.0000	0.000E+00	0.0000	4.224E-08	0.0005	2.004E-09	0.0000	4.592E-10	0.0000	9.890E-10	0.0000
Cs-137	3.996E-05	0.4443	9.651E-12	0.0000	0.000E+00	0.0000	1.743E-06	0.0194	1.345E-07	0.0015	8.353E-08	0.0009	5.229E-08	0.0006
Eu-152	3.622E-05	0.4028	3.178E-11	0.0000	0.000E+00	0.0000	1.091E-08	0.0001	1.869E-10	0.0000	1.235E-11	0.0000	8.423E-09	0.0001
Ni-63	0.000E+00	0.0000	3.199E-11	0.0000	0.000E+00	0.0000	3.787E-07	0.0042	4.719E-09	0.0001	4.369E-08	0.0005	1.478E-08	0.0002
Sr-90	6.458E-08	0.0007	1.919E-11	0.0000	0.000E+00	0.0000	6.953E-06	0.0773	1.238E-07	0.0014	6.992E-08	0.0008	3.637E-08	0.0004
Total	8.023E-05	0.8921	9.320E-11	0.0000	0.000E+00	0.0000	9.128E-06	0.1015	2.652E-07	0.0029	1.976E-07	0.0022	1.128E-07	0.0013

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 7.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	4.032E-06	0.0448
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	4.197E-05	0.4667
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	3.624E-05	0.4030
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.419E-07	0.0049
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.247E-06	0.0806
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	8.994E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 11 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 12
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.100E+01 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	1.301E-03	1.495E+02	7.092E+00	1.625E+00	1.937E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.602E+02
Cs-137	3.424E-02	1.968E+03	1.518E+02	9.429E+01	5.098E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.265E+03
Eu-152	1.868E-02	6.710E+01	1.149E+00	7.591E-02	2.781E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.614E+01
Gd-152	4.968E-16	1.785E-12	3.056E-14	8.080E-16	7.398E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.556E-12
Ni-63	2.004E-01	1.440E+04	1.794E+02	1.661E+03	2.984E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.654E+04
Sr-90	7.206E-03	3.106E+03	5.530E+01	3.124E+01	1.073E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.203E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways
0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years
0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio- Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	2.354E-06	0.0305	3.484E-13	0.0000	2.494E-08	0.0003	1.183E-09	0.0000	2.711E-10	0.0000	5.839E-10	0.0000
Cs-137	3.640E-05	0.4724	8.792E-12	0.0000	1.588E-06	0.0206	1.225E-07	0.0016	7.609E-08	0.0010	4.763E-08	0.0006
Eu-152	2.941E-05	0.3817	2.580E-11	0.0000	8.863E-09	0.0001	1.518E-10	0.0000	1.003E-11	0.0000	6.840E-09	0.0001
Gd-152	0.000E+00	0.0000	2.223E-22	0.0000	3.379E-21	0.0000	5.785E-23	0.0000	1.529E-24	0.0000	2.288E-21	0.0000
Ni-63	0.000E+00	0.0000	3.103E-11	0.0000	3.674E-07	0.0048	4.578E-09	0.0001	4.238E-08	0.0006	1.433E-08	0.0002
Sr-90	5.862E-08	0.0008	1.742E-11	0.0000	6.310E-06	0.0819	1.124E-07	0.0015	6.346E-08	0.0008	3.301E-08	0.0004
Total	6.823E-05	0.8855	8.339E-11	0.0000	8.300E-06	0.1077	2.408E-07	0.0031	1.822E-07	0.0024	1.024E-07	0.0013

Attachment 6 Sheet No. 12 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 13
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	2.381E-06	0.0309
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	3.824E-05	0.4962
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	2.943E-05	0.3819
Gd-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	5.948E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.287E-07	0.0056
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.578E-06	0.0854
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	7.705E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways
0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	2.354E-06	0.0305	3.484E-13	0.0000	0.000E+00	0.0000	2.494E-08	0.0003	1.183E-09	0.0000	2.711E-10	0.0000	5.839E-10	0.0000
Cs-137	3.640E-05	0.4724	8.792E-12	0.0000	0.000E+00	0.0000	1.588E-06	0.0206	1.225E-07	0.0016	7.609E-08	0.0010	4.763E-08	0.0006
Eu-152	2.941E-05	0.3817	2.580E-11	0.0000	0.000E+00	0.0000	8.863E-09	0.0001	1.518E-10	0.0000	1.003E-11	0.0000	6.840E-09	0.0001
Ni-63	0.000E+00	0.0000	3.103E-11	0.0000	0.000E+00	0.0000	3.674E-07	0.0048	4.578E-09	0.0001	4.238E-08	0.0006	1.433E-08	0.0002
Sr-90	5.862E-08	0.0008	1.742E-11	0.0000	0.000E+00	0.0000	6.310E-06	0.0819	1.124E-07	0.0015	6.346E-08	0.0008	3.301E-08	0.0004
Total	6.823E-05	0.8855	8.339E-11	0.0000	0.000E+00	0.0000	8.300E-06	0.1077	2.408E-07	0.0031	1.822E-07	0.0024	1.024E-07	0.0013

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.100E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	2.381E-06	0.0309
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	3.824E-05	0.4962
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	2.943E-05	0.3819
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.287E-07	0.0056
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.578E-06	0.0854
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	7.705E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 13 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 14
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 4.300E+01 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio-Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	1.921E-05	2.209E+00	1.048E-01	2.401E-02	2.861E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.366E+00
Cs-137	1.623E-02	9.329E+02	7.197E+01	4.470E+01	2.417E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.074E+03
Eu-152	3.531E-03	1.269E+01	2.172E-01	1.435E-02	5.258E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.818E+01
Gd-152	1.018E-15	3.657E-12	6.262E-14	1.655E-15	1.516E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.237E-12
Ni-63	1.572E-01	1.130E+04	1.407E+02	1.303E+03	2.341E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.297E+04
Sr-90	3.318E-03	1.430E+03	2.546E+01	1.438E+01	4.941E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.475E+03

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	3.477E-08	0.0013	5.146E-15	0.0000	3.685E-10	0.0000	1.748E-11	0.0000	4.005E-12	0.0000	8.626E-12	0.0000
Cs-137	1.726E-05	0.6370	4.168E-12	0.0000	7.529E-07	0.0278	5.809E-08	0.0021	3.608E-08	0.0013	2.258E-08	0.0008
Eu-152	5.561E-06	0.2053	4.878E-12	0.0000	1.676E-09	0.0001	2.869E-11	0.0000	1.896E-12	0.0000	1.293E-09	0.0000
Gd-152	0.000E+00	0.0000	2.942E-22	0.0000	4.472E-21	0.0000	7.657E-23	0.0000	2.024E-24	0.0000	3.028E-21	0.0000
Ni-63	0.000E+00	0.0000	2.435E-11	0.0000	2.883E-07	0.0106	3.592E-09	0.0001	3.325E-08	0.0012	1.125E-08	0.0004
Sr-90	2.699E-08	0.0010	8.021E-12	0.0000	2.906E-06	0.1072	5.173E-08	0.0019	2.922E-08	0.0011	1.520E-08	0.0006
Total	2.288E-05	0.8446	4.142E-11	0.0000	3.949E-06	0.1458	1.135E-07	0.0042	9.856E-08	0.0036	5.033E-08	0.0019

Attachment 6 Sheet No. 14 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 15
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	3.517E-08	0.0013
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	1.813E-05	0.6691
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	5.564E-06	0.2054
Gd-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	7.873E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.364E-07	0.0124
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.029E-06	0.1118
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	2.709E-05	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	3.477E-08	0.0013	5.146E-15	0.0000	0.000E+00	0.0000	3.685E-10	0.0000	1.748E-11	0.0000	4.005E-12	0.0000	8.626E-12	0.0000
Cs-137	1.726E-05	0.6370	4.168E-12	0.0000	0.000E+00	0.0000	7.529E-07	0.0278	5.809E-08	0.0021	3.608E-08	0.0013	2.258E-08	0.0008
Eu-152	5.561E-06	0.2053	4.878E-12	0.0000	0.000E+00	0.0000	1.676E-09	0.0001	2.869E-11	0.0000	1.896E-12	0.0000	1.293E-09	0.0000
Ni-63	0.000E+00	0.0000	2.435E-11	0.0000	0.000E+00	0.0000	2.883E-07	0.0106	3.592E-09	0.0001	3.325E-08	0.0012	1.125E-08	0.0004
Sr-90	2.699E-08	0.0010	8.021E-12	0.0000	0.000E+00	0.0000	2.906E-06	0.1072	5.173E-08	0.0019	2.922E-08	0.0011	1.520E-08	0.0006
Total	2.288E-05	0.8446	4.142E-11	0.0000	0.000E+00	0.0000	3.949E-06	0.1458	1.135E-07	0.0042	9.856E-08	0.0036	5.033E-08	0.0019

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 4.300E+01 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.517E-08	0.0013
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	1.813E-05	0.6691
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.564E-06	0.2054
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.364E-07	0.0124
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.029E-06	0.1118
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	2.709E-05	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 15 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 16
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.350E+02 years

Radio-Nuclide	Water Independent Pathways (Inhalation w/o radon) Inhalation	Plant	Meat	Milk	Soil	Water Dependent Pathways Water	Fish	Plant	Meat	Milk	Total Ingestion*
Co-60	1.049E-10	1.206E-05	5.720E-07	1.311E-07	1.562E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.292E-05
Cs-137	1.899E-03	1.092E+02	8.421E+00	5.230E+00	2.828E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.256E+02
Eu-152	2.938E-05	1.056E-01	1.808E-03	1.194E-04	4.375E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.512E-01
Gd-152	1.137E-15	4.085E-12	6.995E-14	1.849E-15	1.693E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.850E-12
Ni-63	7.829E-02	5.624E+03	7.007E+01	6.488E+02	1.166E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.460E+03
Sr-90	3.569E-04	1.538E+02	2.739E+00	1.547E+00	5.314E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.587E+02

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	1.899E-13	0.0000	2.810E-20	0.0000	2.012E-15	0.0000	9.543E-17	0.0000	2.187E-17	0.0000	4.710E-17	0.0000
Cs-137	2.019E-06	0.7590	4.877E-13	0.0000	8.809E-08	0.0331	6.796E-09	0.0026	4.221E-09	0.0016	2.642E-09	0.0010
Eu-152	4.628E-08	0.0174	4.060E-14	0.0000	1.394E-11	0.0000	2.388E-13	0.0000	1.578E-14	0.0000	1.076E-11	0.0000
Gd-152	0.000E+00	0.0000	3.105E-22	0.0000	4.720E-21	0.0000	8.081E-23	0.0000	2.136E-24	0.0000	3.196E-21	0.0000
Ni-63	0.000E+00	0.0000	1.212E-11	0.0000	1.435E-07	0.0539	1.788E-09	0.0007	1.656E-08	0.0062	5.599E-09	0.0021
Sr-90	2.903E-09	0.0011	8.628E-13	0.0000	3.126E-07	0.1175	5.565E-09	0.0021	3.143E-09	0.0012	1.635E-09	0.0006
Total	2.068E-06	0.7774	1.351E-11	0.0000	5.442E-07	0.2045	1.415E-08	0.0053	2.392E-08	0.0090	9.887E-09	0.0037

Attachment 6 Sheet No. 16 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 17
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	1.920E-13	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	2.121E-06	0.7972
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	4.630E-08	0.0174
Gd-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	8.309E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.675E-07	0.0629
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.258E-07	0.1225
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
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	2.661E-06	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways
0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years
0 Water Independent Pathways (Inhalation excludes radon)
0

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	1.899E-13	0.0000	2.810E-20	0.0000	0.000E+00	0.0000	2.012E-15	0.0000	9.543E-17	0.0000	2.187E-17	0.0000	4.710E-17	0.0000
Cs-137	2.019E-06	0.7590	4.877E-13	0.0000	0.000E+00	0.0000	8.809E-08	0.0331	6.796E-09	0.0026	4.221E-09	0.0016	2.642E-09	0.0010
Eu-152	4.628E-08	0.0174	4.060E-14	0.0000	0.000E+00	0.0000	1.394E-11	0.0000	2.388E-13	0.0000	1.578E-14	0.0000	1.076E-11	0.0000
Ni-63	0.000E+00	0.0000	1.212E-11	0.0000	0.000E+00	0.0000	1.435E-07	0.0539	1.788E-09	0.0007	1.656E-08	0.0062	5.599E-09	0.0021
Sr-90	2.903E-09	0.0011	8.628E-13	0.0000	0.000E+00	0.0000	3.126E-07	0.1175	5.565E-09	0.0021	3.143E-09	0.0012	1.635E-09	0.0006
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
Total	2.068E-06	0.7774	1.351E-11	0.0000	0.000E+00	0.0000	5.442E-07	0.2045	1.415E-08	0.0053	2.392E-08	0.0090	9.887E-09	0.0037

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.350E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	1.920E-13	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	2.121E-06	0.7972
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	4.630E-08	0.0174
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.675E-07	0.0629
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.258E-07	0.1225
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
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	2.661E-06	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 17 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 18
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 3.000E+02 years

Radio-	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					Total
Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Ingestion*
Co-60	3.820E-20	4.390E-15	2.083E-16	4.772E-17	5.688E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.703E-15
Cs-137	4.049E-05	2.327E+00	1.795E-01	1.115E-01	6.030E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.679E+00
Eu-152	5.471E-09	1.965E-05	3.365E-07	2.224E-08	8.146E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.816E-05
Gd-152	1.136E-15	4.080E-12	6.986E-14	1.846E-15	1.691E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.843E-12
Ni-63	2.241E-02	1.610E+03	2.006E+01	1.857E+02	3.337E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.849E+03
Sr-90	6.544E-06	2.821E+00	5.022E-02	2.837E-02	9.745E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.909E+00

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil
and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Plant		Meat		Milk		Soil	
Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
Co-60	6.913E-23	0.0000	3.419E-30	0.0000	7.325E-25	0.0000	3.475E-26	0.0000	7.962E-27	0.0000	1.715E-26	0.0000
Cs-137	4.305E-08	0.4342	1.040E-14	0.0000	1.878E-09	0.0189	1.449E-10	0.0015	9.000E-11	0.0009	5.634E-11	0.0006
Eu-152	8.616E-12	0.0001	7.558E-18	0.0000	2.596E-15	0.0000	4.445E-17	0.0000	2.937E-18	0.0000	2.004E-15	0.0000
Gd-152	0.000E+00	0.0000	3.100E-22	0.0000	4.711E-21	0.0000	8.067E-23	0.0000	2.132E-24	0.0000	3.190E-21	0.0000
Ni-63	0.000E+00	0.0000	3.470E-12	0.0000	4.109E-08	0.4144	5.119E-10	0.0052	4.740E-09	0.0478	1.603E-09	0.0162
Sr-90	5.324E-11	0.0005	1.582E-14	0.0000	5.731E-09	0.0578	1.020E-10	0.0010	5.764E-11	0.0006	2.998E-11	0.0003
Total	4.311E-08	0.4349	3.496E-12	0.0000	4.870E-08	0.4911	7.588E-10	0.0077	4.887E-09	0.0493	1.689E-09	0.0170

Attachment 6 Sheet No. 18 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 19
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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	6.992E-23	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	4.522E-08	0.4561
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	8.620E-12	0.0001
Gd-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	8.294E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.794E-08	0.4836
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.974E-09	0.0603
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	9.915E-08	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
Co-60	6.913E-23	0.0000	3.419E-30	0.0000	0.000E+00	0.0000	7.325E-25	0.0000	3.475E-26	0.0000	7.962E-27	0.0000	1.715E-26	0.0000
Cs-137	4.305E-08	0.4342	1.040E-14	0.0000	0.000E+00	0.0000	1.878E-09	0.0189	1.449E-10	0.0015	9.000E-11	0.0009	5.634E-11	0.0006
Eu-152	8.616E-12	0.0001	7.558E-18	0.0000	0.000E+00	0.0000	2.596E-15	0.0000	4.445E-17	0.0000	2.937E-18	0.0000	2.004E-15	0.0000
Ni-63	0.000E+00	0.0000	3.470E-12	0.0000	0.000E+00	0.0000	4.109E-08	0.4144	5.119E-10	0.0052	4.740E-09	0.0478	1.603E-09	0.0162
Sr-90	5.324E-11	0.0005	1.582E-14	0.0000	0.000E+00	0.0000	5.731E-09	0.0578	1.020E-10	0.0010	5.764E-11	0.0006	2.998E-11	0.0003
Total	4.311E-08	0.4349	3.496E-12	0.0000	0.000E+00	0.0000	4.870E-08	0.4911	7.588E-10	0.0077	4.887E-09	0.0493	1.689E-09	0.0170

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	6.992E-23	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	4.522E-08	0.4561
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	8.620E-12	0.0001
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.794E-08	0.4836
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.974E-09	0.0603
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	9.915E-08	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 19 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 20
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Amount of Intake Quantities QINT(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As pCi/yr at t= 1.000E+03 years

	Water Independent Pathways (Inhalation w/o radon)					Water Dependent Pathways					
Radio-Nuclide	Inhalation	Plant	Meat	Milk	Soil	Water	Fish	Plant	Meat	Milk	Total Ingestion*
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	0.000E+00	0.000E+00
Cs-137	3.292E-12	1.892E-07	1.460E-08	9.067E-09	4.902E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.218E-21
Eu-152	8.194E-25	2.944E-21	5.041E-23	3.331E-24	1.220E-21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.789E-12
Gd-152	1.125E-15	4.043E-12	6.922E-14	1.829E-15	1.675E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.170E+00
Ni-63	1.111E-04	7.984E+00	9.947E-02	9.210E-01	1.655E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.248E-07
Sr-90	2.806E-13	1.210E-07	2.154E-09	1.217E-09	4.179E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	

* Sum of all ingestion pathways, i.e. water independent plant, meat, milk, soil and water-dependent water, fish, plant, meat, milk pathways

0

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Plant		Meat		Milk		Soil	
Radio-Nuclide	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.	risk	fract.
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
Cs-137	3.500E-15	0.0000	8.454E-22	0.0000	1.527E-16	0.0000	1.178E-17	0.0000	7.317E-18	0.0000	4.580E-18	0.0000
Eu-152	1.291E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Gd-152	0.000E+00	0.0000	3.071E-22	0.0000	4.668E-21	0.0000	7.993E-23	0.0000	2.113E-24	0.0000	3.161E-21	0.0000
Ni-63	0.000E+00	0.0000	1.721E-14	0.0001	2.037E-10	0.8569	2.538E-12	0.0107	2.350E-11	0.0989	7.949E-12	0.0334
Sr-90	2.283E-18	0.0000	6.785E-22	0.0000	2.458E-16	0.0000	4.376E-18	0.0000	2.472E-18	0.0000	1.286E-18	0.0000
Total	3.503E-15	0.0000	1.721E-14	0.0001	2.037E-10	0.8569	2.538E-12	0.0107	2.350E-11	0.0989	7.949E-12	0.0334

Attachment 6 Sheet No. 20 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 6

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 21
Intrisk : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Excess Cancer Risks CNRS(i,p,t) for Individual Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All Pathways** risk	All Pathways** fract.
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
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	3.677E-15	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	1.291E-27	0.0000
Gd-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	8.218E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.378E-10	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.562E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.378E-10	1.0000

** Sum of water independent ground, inhalation, plant, meat, milk, soil
and water dependent water, fish, plant, meat, milk pathways

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground risk	Ground fract.	Inhalation risk	Inhalation fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	Soil risk	Soil fract.
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	3.500E-15	0.0000	8.454E-22	0.0000	0.000E+00	0.0000	1.527E-16	0.0000	1.178E-17	0.0000	7.317E-18	0.0000	4.580E-18	0.0000
Eu-152	1.291E-27	0.0000	3.071E-22	0.0000	0.000E+00	0.0000	4.668E-21	0.0000	7.993E-23	0.0000	2.113E-24	0.0000	3.161E-21	0.0000
Ni-63	0.000E+00	0.0000	1.721E-14	0.0001	0.000E+00	0.0000	2.037E-10	0.8569	2.538E-12	0.0107	2.350E-11	0.0989	7.949E-12	0.0334
Sr-90	2.283E-18	0.0000	6.785E-22	0.0000	0.000E+00	0.0000	2.458E-16	0.0000	4.376E-18	0.0000	2.472E-18	0.0000	1.286E-18	0.0000
Total	3.503E-15	0.0000	1.721E-14	0.0001	0.000E+00	0.0000	2.037E-10	0.8569	2.538E-12	0.0107	2.350E-11	0.0989	7.949E-12	0.0334

0

Total Excess Cancer Risk CNRSI(i,p,t)*** for Initially Existent Radionuclides (i) and Pathways (p)
and Fraction of Total Risk at t= 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water risk	Water fract.	Fish risk	Fish fract.	Radon risk	Radon fract.	Plant risk	Plant fract.	Meat risk	Meat fract.	Milk risk	Milk fract.	All pathways risk	All pathways fract.
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	3.677E-15	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	8.218E-21	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.378E-10	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.562E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.378E-10	1.0000

***CNRSI(i,p,t) includes contribution from decay daughter radionuclides

Attachment 6 Sheet No. 21 of 21
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

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1RESRAD, Version 6.3      T« Limit = 180 days       10/02/2007  15:05  Page   1
 Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
 File    : 100-F-26-14_OB-BCL.RAD

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                       ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ
            Part IV: Concentration of Radionuclides
            ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ

 Concentration of radionuclides in different media
      Time= 0.000E+00 ....................................   2
      Time= 1.000E+00 ....................................   3
      Time= 3.000E+00 ....................................   4
      Time= 7.000E+00 ....................................   5
      Time= 1.100E+01 ....................................   6
      Time= 4.300E+01 ....................................   7
      Time= 1.350E+02 ....................................   8
      Time= 3.000E+02 ....................................   9
      Time= 1.000E+03 ....................................  10
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Attachment 7 Sheet No. 1 of 10
Originator: S. W. Clark [signature] Date 10/3/07
Chk'd By H. M. Sulloway [initials] Date 10/3/07
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 2
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
Co-60	1.790E-01	1.790E-01	1.724E-06	0.000E+00	0.000E+00
Cs-137	1.430E+00	1.430E+00	1.378E-05	0.000E+00	0.000E+00
Eu-152	1.070E+00	1.070E+00	1.031E-05	0.000E+00	0.000E+00
Gd-152	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	7.040E+00	7.040E+00	6.782E-05	0.000E+00	0.000E+00
Sr-90	3.040E-01	3.040E-01	2.929E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	1.432E+01	1.432E+01	1.432E+01	1.432E+01	2.127E+01	1.754E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	5.720E+01	5.720E+01	5.720E+01	5.720E+01	1.381E+02	3.089E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.676E+00	2.678E+00	2.678E+00	2.678E+00	1.434E+00	3.411E-02	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
Ni-63	0.000E+00	3.520E+02	3.520E+02	3.520E+02	3.520E+02	1.373E+02	4.576E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	9.120E+01	9.120E+01	9.120E+01	9.120E+01	5.083E+01	1.034E+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 7 Sheet No. 2 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 3
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
Co-60	1.569E-01	1.569E-01	1.512E-06	0.000E+00	0.000E+00
Cs-137	1.397E+00	1.397E+00	1.346E-05	0.000E+00	0.000E+00
Eu-152	1.016E+00	1.016E+00	9.786E-06	0.000E+00	0.000E+00
Gd-152	1.868E-15	1.868E-15	1.800E-20	0.000E+00	0.000E+00
Ni-63	6.987E+00	6.987E+00	6.731E-05	0.000E+00	0.000E+00
Sr-90	2.967E-01	2.967E-01	2.859E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	1.255E+01	1.255E+01	1.264E+01	1.256E+01	1.864E+01	1.538E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	5.588E+01	5.588E+01	5.596E+01	5.589E+01	1.350E+02	3.018E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.540E+00	2.542E+00	2.549E+00	2.543E+00	1.361E+00	3.238E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.672E-15	4.675E-15	4.426E-15	4.663E-15	2.504E-15	2.392E-17	0.000E+00	0.000E+00
Ni-63	0.000E+00	3.494E+02	3.494E+02	3.495E+02	3.494E+02	1.363E+02	4.542E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	8.902E+01	8.902E+01	8.914E+01	8.903E+01	4.962E+01	1.009E+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 7 Sheet No. 3 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 4
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
Co-60	1.206E-01	1.206E-01	1.162E-06	0.000E+00	0.000E+00
Cs-137	1.333E+00	1.333E+00	1.285E-05	0.000E+00	0.000E+00
Eu-152	9.153E-01	9.153E-01	8.818E-06	0.000E+00	0.000E+00
Gd-152	5.325E-15	5.325E-15	5.130E-20	0.000E+00	0.000E+00
Ni-63	6.882E+00	6.882E+00	6.630E-05	0.000E+00	0.000E+00
Sr-90	2.827E-01	2.827E-01	2.723E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	9.646E+00	9.646E+00	9.716E+00	9.650E+00	1.432E+01	1.182E+00	0.000E+00	0.000E+00
Cs-137	0.000E+00	5.334E+01	5.334E+01	5.341E+01	5.334E+01	1.288E+02	2.880E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.289E+00	2.291E+00	2.297E+00	2.291E+00	1.227E+00	2.918E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	1.332E-14	1.333E-14	1.310E-14	1.332E-14	7.138E-15	6.800E-17	0.000E+00	0.000E+00
Ni-63	0.000E+00	3.441E+02	3.441E+02	3.443E+02	3.441E+02	1.342E+02	4.473E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	8.481E+01	8.481E+01	8.492E+01	8.482E+01	4.727E+01	9.612E+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 7 Sheet No. 4 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 5
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Concentration of radionuclides in environmental media
at t = 7.000E+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
Co-60	7.119E-02	7.119E-02	6.858E-07	0.000E+00	0.000E+00
Cs-137	1.215E+00	1.215E+00	1.170E-05	0.000E+00	0.000E+00
Eu-152	7.433E-01	7.433E-01	7.161E-06	0.000E+00	0.000E+00
Gd-152	1.125E-14	1.125E-14	1.084E-19	0.000E+00	0.000E+00
Ni-63	6.676E+00	6.676E+00	6.432E-05	0.000E+00	0.000E+00
Sr-90	2.566E-01	2.566E-01	2.472E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 7.000E+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
Co-60	0.000E+00	5.695E+00	5.695E+00	5.737E+00	5.698E+00	8.458E+00	6.977E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	4.859E+01	4.859E+01	4.865E+01	4.859E+01	1.173E+02	2.624E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.859E+00	1.860E+00	1.866E+00	1.860E+00	9.962E-01	2.370E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	2.812E-14	2.815E-14	2.797E-14	2.814E-14	1.508E-14	1.435E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	3.338E+02	3.338E+02	3.340E+02	3.338E+02	1.302E+02	4.340E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	7.697E+01	7.697E+01	7.708E+01	7.698E+01	4.290E+01	8.724E+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 7 Sheet No. 5 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 6
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.100E+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
Co-60	4.203E-02	4.203E-02	4.050E-07	0.000E+00	0.000E+00
Cs-137	1.106E+00	1.106E+00	1.066E-05	0.000E+00	0.000E+00
Eu-152	6.035E-01	6.035E-01	5.815E-06	0.000E+00	0.000E+00
Gd-152	1.606E-14	1.606E-14	1.547E-19	0.000E+00	0.000E+00
Ni-63	6.477E+00	6.477E+00	6.240E-05	0.000E+00	0.000E+00
Sr-90	2.329E-01	2.329E-01	2.243E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.100E+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
Co-60	0.000E+00	3.363E+00	3.363E+00	3.387E+00	3.364E+00	4.994E+00	4.120E-01	0.000E+00	0.000E+00
Cs-137	0.000E+00	4.426E+01	4.426E+01	4.432E+01	4.426E+01	1.069E+02	2.390E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	1.509E+00	1.510E+00	1.515E+00	1.511E+00	8.090E-01	1.924E-02	0.000E+00	0.000E+00
Gd-152	0.000E+00	4.015E-14	4.018E-14	4.004E-14	4.018E-14	2.152E-14	2.048E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	3.238E+02	3.239E+02	3.240E+02	3.239E+02	1.263E+02	4.210E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	6.986E+01	6.986E+01	6.996E+01	6.987E+01	3.894E+01	7.918E+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 7 Sheet No. 6 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 7
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Concentration of radionuclides in environmental media
at t = 4.300E+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
Co-60	6.209E-04	6.209E-04	5.982E-09	0.000E+00	0.000E+00
Cs-137	5.246E-01	5.246E-01	5.054E-06	0.000E+00	0.000E+00
Eu-152	1.141E-01	1.141E-01	1.099E-06	0.000E+00	0.000E+00
Gd-152	3.289E-14	3.289E-14	3.169E-19	0.000E+00	0.000E+00
Ni-63	5.082E+00	5.082E+00	4.896E-05	0.000E+00	0.000E+00
Sr-90	1.072E-01	1.072E-01	1.033E-06	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 4.300E+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
Co-60	0.000E+00	4.968E-02	4.968E-02	5.004E-02	4.970E-02	7.377E-02	6.086E-03	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.098E+01	2.098E+01	2.101E+01	2.099E+01	5.068E+01	1.133E+01	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.853E-01	2.856E-01	2.864E-01	2.856E-01	1.529E-01	3.638E-03	0.000E+00	0.000E+00
Gd-152	0.000E+00	8.225E-14	8.232E-14	8.230E-14	8.232E-14	4.409E-14	4.195E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	2.541E+02	2.541E+02	2.542E+02	2.541E+02	9.910E+01	3.303E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	3.217E+01	3.217E+01	3.221E+01	3.217E+01	1.793E+01	3.646E+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 7 Sheet No. 7 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
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ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 8
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.RAD

Concentration of radionuclides in environmental media
at t = 1.350E+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
Co-60	3.390E-09	3.390E-09	3.266E-14	0.000E+00	0.000E+00
Cs-137	6.138E-02	6.138E-02	5.913E-07	0.000E+00	0.000E+00
Eu-152	9.495E-04	9.495E-04	9.148E-09	0.000E+00	0.000E+00
Gd-152	3.675E-14	3.675E-14	3.540E-19	0.000E+00	0.000E+00
Ni-63	2.530E+00	2.530E+00	2.437E-05	0.000E+00	0.000E+00
Sr-90	1.153E-02	1.153E-02	1.111E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.350E+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
Co-60	0.000E+00	2.712E-07	2.712E-07	2.732E-07	2.713E-07	4.028E-07	3.323E-08	0.000E+00	0.000E+00
Cs-137	0.000E+00	2.455E+00	2.455E+00	2.458E+00	2.455E+00	5.929E+00	1.326E+00	0.000E+00	0.000E+00
Eu-152	0.000E+00	2.374E-03	2.376E-03	2.383E-03	2.377E-03	1.273E-03	3.027E-05	0.000E+00	0.000E+00
Gd-152	0.000E+00	9.188E-14	9.196E-14	9.197E-14	9.197E-14	4.925E-14	4.686E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	1.265E+02	1.265E+02	1.266E+02	1.265E+02	4.934E+01	1.645E+02	0.000E+00	0.000E+00
Sr-90	0.000E+00	3.460E+00	3.460E+00	3.465E+00	3.460E+00	1.929E+00	3.922E-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 7 Sheet No. 8 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 9
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
Co-60	1.234E-18	1.234E-18	1.189E-23	0.000E+00	0.000E+00
Cs-137	1.309E-03	1.309E-03	1.261E-08	0.000E+00	0.000E+00
Eu-152	1.768E-07	1.768E-07	1.703E-12	0.000E+00	0.000E+00
Gd-152	3.670E-14	3.670E-14	3.536E-19	0.000E+00	0.000E+00
Ni-63	7.242E-01	7.242E-01	6.977E-06	0.000E+00	0.000E+00
Sr-90	2.115E-04	2.115E-04	2.037E-09	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
Co-60	0.000E+00	9.875E-17	9.875E-17	9.947E-17	9.879E-17	1.467E-16	1.210E-17	0.000E+00	0.000E+00
Cs-137	0.000E+00	5.235E-02	5.235E-02	5.242E-02	5.235E-02	1.264E-01	2.827E-02	0.000E+00	0.000E+00
Eu-152	0.000E+00	4.421E-07	4.424E-07	4.437E-07	4.425E-07	2.370E-07	5.636E-09	0.000E+00	0.000E+00
Gd-152	0.000E+00	9.177E-14	9.184E-14	9.185E-14	9.185E-14	4.919E-14	4.680E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	3.621E+01	3.621E+01	3.623E+01	3.622E+01	1.412E+01	4.708E+01	0.000E+00	0.000E+00
Sr-90	0.000E+00	6.345E-02	6.345E-02	6.353E-02	6.345E-02	3.536E-02	7.191E-03	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 7 Sheet No. 9 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

ATTACHMENT 7

1RESRAD, Version 6.3 T« Limit = 180 days 10/02/2007 15:05 Page 10
Concent : 100-F-26:14 Overburden/Below Cleanup Level Stockpile RESRAD Calculation
File : 100-F-26-14_OB-BCL.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
Co-60	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137	1.064E-10	1.064E-10	1.025E-15	0.000E+00	0.000E+00
Eu-152	2.648E-23	2.648E-23	2.551E-28	0.000E+00	0.000E+00
Gd-152	3.636E-14	3.636E-14	3.503E-19	0.000E+00	0.000E+00
Ni-63	3.592E-03	3.592E-03	3.460E-08	0.000E+00	0.000E+00
Sr-90	9.069E-12	9.069E-12	8.737E-17	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of 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
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	4.256E-09	4.256E-09	4.262E-09	4.256E-09	1.028E-08	2.298E-09	0.000E+00	0.000E+00
Eu-152	0.000E+00	6.621E-23	6.627E-23	6.646E-23	6.628E-23	3.549E-23	8.443E-25	0.000E+00	0.000E+00
Gd-152	0.000E+00	9.092E-14	9.100E-14	9.101E-14	9.101E-14	4.874E-14	4.637E-16	0.000E+00	0.000E+00
Ni-63	0.000E+00	1.796E-01	1.796E-01	1.797E-01	1.796E-01	7.004E-02	2.335E-01	0.000E+00	0.000E+00
Sr-90	0.000E+00	2.721E-09	2.721E-09	2.725E-09	2.721E-09	1.517E-09	3.084E-10	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 7 Sheet No. 10 of 10
Originator: S. W. Clark Date
Chk'd By H. M. Sulloway Date
Calc. No. 0100F-CA-V0312 Rev. No. 0

APPENDIX E

DATA QUALITY ASSESSMENT

DATA QUALITY ASSESSMENT

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 2007a). A review of the sample design (WCH 2007a), the field logbook (WCH 2007b), and applicable analytical data packages has been performed as part of this DQA. This DQA was performed in accordance with site specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan*, (100 Area SAP) (DOE-RL 2005).

To ensure quality data, the 100 Area SAP data assurance requirements and the data validation procedures for chemical 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., cleanup verification decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2000).

The cleanup verification sampling approach for the 100-F-26:14, pipeline site included a sample design with multiple subunit areas. All samples were collected per the sample design. Verification sample data collected at the 100-F-26:14 pipeline site(s) were provided by the laboratories in 5 sample delivery groups (SDGs). For the excavation footprint (referred to as either shallow-zone verification or verification in the data packages), verification sample data was provided in two SDGs: SDG K0916 and SDG J00125. SDG K0916 was submitted for third-party validation. For the overburden and layback stockpiles (referred to as below contaminant level (BCL) stockpiles in the data packages), verification sample data was provided in three SDGs: SDG K0910, SDG J00124, and SDG K0925. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K0916

This SDG comprises five field samples (J15BV6-J15BV9 and J15BW0) collected from the 100-F-26:14 excavation footprint. One field duplicate pair is included in this SDG (J15BV8/ J15BV9). These samples were analyzed for ICP metals, mercury, hexavalent chromium, radionuclides by gamma spectroscopy, total strontium by beta counting, and nickel-63 by liquid scintillation counting (LSC). SDG K0916 was submitted for third-party validation. No major deficiencies were found in SDG K0916. Minor deficiencies are as follows:

In the ICP metals analysis, the RPD for silicon is above the acceptance criteria at 64.8%. The silicon data for SDG K0916 was qualified as estimated with a "J" flag by third party validation. Estimated data are useable for decision making purposes.

The matrix spike (MS) recoveries for five ICP metals (aluminum, iron, antimony, silicon and vanadium) are out of project acceptance criteria. For most of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post digestion spikes and serial dilutions were prepared for each analyte with results ranging between 98.9-105.5%. Antimony and vanadium did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony and vanadium were 69.6% and 71.8%, respectively. The antimony and

vanadium data for SDG K0916 were qualified as estimated with a "J" flag by third party validation. Estimated data are useable for decision making purposes.

SDG J00125

This SDG comprises one field sample (J15BW2), a split of sample J15BV8 from SDG K0916. This sample was analyzed at Severn Trent Laboratories, Inc., with the analyses including ICP metals, mercury, hexavalent chromium, radionuclides by gamma spectroscopy, total strontium by gas proportional counting, and nickel-63 by LSC. No major deficiencies were found in SDG J00125. Minor deficiencies are as follows:

In the ICP metals analysis, the matrix spike (MS) and/or matrix spike duplicate (MSD) recoveries for five ICP metals (aluminum, iron, manganese, antimony, and silicon) are out of project acceptance criteria. 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 and/or MSD 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 and MSD recoveries for antimony were 46% and 48% respectively. The data for antimony in SDG J00125 may be considered estimated. Estimated data are useable for decision making purposes.

SDG K0910

This SDG comprises five field samples (J15BV1 – J15BV5) collected from the overburden and layback stockpiles. One field duplicate pair is included in this SDG (J15BV1/ J15BV2). These samples were analyzed for ICP metals, mercury, hexavalent chromium, radionuclides by gamma spectroscopy, total strontium by beta counting, and nickel-63 by LSC. No major deficiencies were found in SDG K0910. Minor deficiencies are as follows:

In the ICP metals analysis, the RPD for silicon is above the acceptance criteria at 59%. The silicon sample results may be considered estimated. Estimated data are considered acceptable for the intended use of the data.

In addition, the matrix spike (MS) recoveries for four ICP metals (aluminum, iron, manganese, and silicon) are out of project acceptance criteria. For all of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post digestion spikes and serial dilutions were prepared for each analyte with results ranging between 97.8-110.6%. The data are useable for decision making purposes.

SDG J00124

This SDG comprises one field sample (J15BW1), a split of sample J15BV1 from SDG K0910. This sample was analyzed at Severn Trent Laboratories, Inc., with the analyses including ICP metals, mercury, hexavalent chromium, radionuclides by gamma spectroscopy, total strontium by gas proportional counting, and nickel-63 by LSC. No major deficiencies were found in SDG J00124. Minor deficiencies are as follows:

For the gamma spectroscopy, insufficient sample material was available to prepare a laboratory duplicate of sample J15BW1. The duplicate result was obtained by recounting sample J15BW1 on a different detector.

In the ICP metals analysis, the MS recoveries for six ICP metals (aluminum, iron, manganese, antimony, silicon, and zinc) are out of acceptance criteria. 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. For these analytes, 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 zinc did not have mismatched spike and native concentrations in the original MS. The original MS and MSD recoveries for antimony are both 47%. The original MSD recovery for zinc is 146%. The antimony and zinc data for sample J15BW1 may be considered estimated. The data are useable for decision-making purposes.

SDG K0925

This SDG comprises two samples (J15FF4 and J15FF5) from the 100-F-26:14 overburden and layback stockpiles. These samples were analyzed for ICP metals, mercury, hexavalent chromium, radionuclides by gamma spectroscopy, total strontium by gas proportional counting, and nickel-63 by LSC. The SDG also includes two samples from the 118-F-5 waste site; the results from the 118-F-5 waste site are not included in this data evaluation. The sample J15BV1 carbon-14 result reported in SDG K0910 indicated that the stockpile soil in area A1 of the overburden and layback stockpile decision unit was in excess of the remedial action goal (RAG). The sample J15BV5 carbon-14 result reported in SDG K0910 indicated that the stockpile soil in area A4 of the overburden and layback stockpile decision unit was also in excess of the RAG. The contaminated soil was removed; sample J15FF4 was taken to replace sample J15BV1, and sample J15FF5 was taken to replace sample J15BV5 in statistical calculations for verification sampling of the 100-F-26:14 site. No major deficiencies were found in SDG K0925. Minor deficiencies are as follows:

In the ICP metals analysis, the MS recoveries for four ICP metals (aluminum, iron, manganese, and silicon) are out of acceptance criteria. For each of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. The data are useable for decision-making purposes.

Also in the ICP metals analysis, the RPDs for arsenic, barium, and potassium are above the acceptance criteria at 34%, 42.6%, and 42.6%, respectively. The sample results for these analytes may be considered estimated. Estimated data are considered acceptable for the intended use of the data.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field QA/QC measures are used to assess potential sources of error and cross contamination of samples that could bias results. The field QA/QC samples for the 100-F-26:14 site, listed in the field logbook (WCH 2007b), are primary and duplicate field samples from the excavation footprint (J15BV8/ J15BV9), and a split sample of the excavation footprint sample J15F83 (J15BW2). Primary, duplicate, and split samples (J15BV1/J15BV2/J15BW1) were collected from the overburden and layback stockpiles Area A1, however, the sample results indicated that carbon-14 detections exceed the RAG. The contaminated soil was removed, and sample J15FF4 was taken to replace sample J15BV1. Therefore, the evaluation of field QA/QC samples for the overburden and layback stockpiles is not included in this DQA. The main and QA/QC sample results for the excavation shallow zone are presented in Appendix C.

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the duplicate samples for each COC. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The 95% upper confidence limit (UCL) calculation brief in Appendix D provides details on duplicate pair evaluation and RPD calculation. The data are suitable for the intended purpose of cleanup verification.

Radionuclides. None of the radionuclide RPDs calculated for the field duplicates are above the acceptance criteria (30%). The data are useable for decision making purposes.

Nonradionuclides. The RPD calculated for aluminum in the excavation shallow zone duplicate (J15BV9) is above the acceptance criteria (30%) at 96%. The RPDs calculated for barium in the excavation shallow zone duplicate (J15BV9) and split (J15BW2) samples are above the acceptance criteria (30%) at 148% and 104%, respectively. The RPD calculated for boron in the excavation shallow zone split (J15BW2) is above the acceptance criteria (30%) at 80%. The RPDs calculated for calcium in the excavation shallow zone duplicate (J15BV9) and split (J15BW2) samples are above the acceptance criteria (30%) at 127% and 42%, respectively. The RPD calculated for copper in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria (30%) at 84%. The RPD calculated for iron in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria, at 66.7%. The RPD calculated for magnesium in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria, at 76%. The RPD calculated for manganese in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria (30%) at 64%.The RPDs calculated for silicon in the excavation shallow zone duplicate (J15BV9) and split (J15BW2) samples are above the acceptance criteria (30%) at 54% and 118%, respectively. The RPD calculated for vanadium in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria, at 74%. The RPD calculated for zinc in the excavation shallow zone duplicate (J15BV9) sample is above the acceptance criteria, at 55%. Elevated RPDs, such as these, in the analysis of environmental soil samples, are largely attributed to heterogeneities in the soil matrix and only in small part attributed to precision and accuracy issues at the laboratory. The data are useable for decision-making purposes.

RPDs for the remaining radionuclides and nonradionuclide analytes are not calculated because an evaluation of the data shows the analytes are not detected in both the main and duplicate sample at more than 5 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 data are useable for decision making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix D) to indicate that a visual check of the data is required by the reviewer. For the excavation shallow zone duplicate and split samples, boron and chromium duplicate samples required this check, and sodium duplicate and split samples required this check. These results are attributed to heterogeneities in the sample matrix from which the samples were collected. 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 quality control (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 analysis performed. The DQA review of the 100-F-26:14 verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-F-26:14 pipeline site concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of QA and QC deficiencies. The analytical data were found acceptable for decision-making purposes. The verification sample analytical data are stored in the ENRE project-specific database prior to being submitted for inclusion in the HEIS database. The verification sample analytical data are also summarized in Appendix D.

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