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Date: July 22, 2004
Refer To: ER2004-0390

Mr. John Young, Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
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Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF RESPONSE TO APPROVAL AS MODIFIED PHASE III RFI REPORT FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 16-021(c)-99, LOS ALAMOS NATIONAL LABORATORY (LANL)

Dear Mr. Young:

Enclosed are two copies of the (LANL) Risk Reduction and Environmental Stewardship–Remediation Services (RRES-RS) Project's Response to your approval as modified for the Phase III RFI Report for SWMU 16-021(c)-99. The Department of Energy Los Alamos Site Operations Office received the approval on June 23, 2004 and the RS Project office received the approval on June 23, 2004.

If you have any questions, please contact Donald Hickmott (505) 665-1116 or David Gregory at (505) 667-5808.

Sincerely,

David McInroy, Deputy Project Director
Remediation Services
Los Alamos National Laboratory

Sincerely,

Thomas Wilson for

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Operations

DM/DG/DH/th

Enclosure: Response to Approval (ER2004-0389)
Certification

6504

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CERTIFICATION

CERTIFICATION BY THE RISK REDUCTION AND ENVIRONMENTAL STEWARDSHIP–REMEDIATION SERVICES (RRES–RS) PROJECT TECHNICAL REPRESENTATIVES

DOCUMENT TITLE: **SUBMITTAL OF RESPONSE TO APPROVAL AS MODIFIED PHASE III RFI REPORT FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 16-021(c)-99, LOS ALAMOS NATIONAL LABORATORY (LANL)**

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Name: _____ Date: 7/23/04

David McInroy, Deputy Project Director
Remediation Services
Los Alamos National Laboratory

or

_____ Date: _____

Beverly A. Ramsey, Division Leader
Risk Reduction and Environmental Stewardship Division
Los Alamos National Laboratory

_____ Date: 7/23/04

David Gregory, Federal Project Director
Environmental Restoration Program
Department Of Energy/Los Alamos Site Office

or

_____ Date: _____

Herman LeDoux,
Assistant Area Manager of
Environmental Projects
Department Of Energy/Los Alamos Site Office

Response to Approval as Modified
Dated June 21, 2004
Phase III RFI Report for SWMU 16-021(c)-99
(Note: Attachment and comment numbers refer to the original NOD dated 12/23/03)

Attachment 1 General Comment:

2. *The Permittees response to this comment indicates that potential doses from radionuclides of concern in surface water were calculated using the RESRAD version 6.21 computer code and that the resulting doses will be added to the text of the report. The input and output files from the RESRAD runs should be provided to allow for concurrence with the resulting doses. The Permittees should provide both the input and output files for the RESRAD files and include these files as an Appendix to the report.*

LANL Response:
LANL has included the RESRAD input and output files as Appendix 1 to this response. The human health risk assessment (Appendix K) will be revised pending NMED approval of this response to include this information as Attachment 2 to Appendix K of the RFI report. Radionuclide concentration inputs for surface water pathway are shown on page 3 of the appendix (item R012). As stated in the NOD response, the total dose is 0.000003 millirem per year (mrem/yr), well below the dose of 15 mrem/yr allowed by U.S. Department of Energy-Albuquerque Office Guidelines (DOE-AL 2000, 67153).

Attachment 1 Specific Comments:

4. *Section 1.5.1 Frequency of Detection, pg. 1-18, paragraph 3:*

NMED Comment:
This comment addressed concerns over the elimination of chemicals detected in less than 5% of samples. The response to this comment adequately addresses the comment; however, some additional clarification to the response is warranted. EPA guidance (Risk Assessment Guidance for Superfund [RAGS], 1989) allows for the elimination of chemicals from a risk assessment if it is detected infrequently (e.g., less than 5% per 20 samples), not detected in other sampled media, and/or if there is no reason to believe the chemical may be present. However, RAGS clearly states that, "chemicals expected to be present should not be eliminated" from the risk assessment. The Permittees must clarify that if there is any evidence that a constituent has been historically present at the site, and if data indicate the presence of this constituent, then this constituent would be included in the risk assessment.

LANL Response:
All detected compounds related to the site history were evaluated in the human health risk assessment. As stated in the response to this comment in the NOD response: "no chemical, regardless of frequency of detection, was eliminated from the risk assessment if it was detected or had detection limits above a screening level. Therefore, the elimination of chemicals based on less than 5% detection does not change the results of the risk assessment." Since all detected chemicals were screened in the risk assessment, no change to the risk assessment is required. In the future, if LANL can show that a constituent is not site related as stated in RAGS (EPA 1989, 08021), then use of the 5% detection rule will be requested for that constituent.

6. *Section 1.5.3 Comparison to Regulatory Standards (Water Only), pg. 1-21, paragraph 3:*

NMED Comment:
Even though NMED has requested that the Permittees use the EPA Region 6 (or 9) residential tap water screening levels, the numeric human health water quality criteria for persistent toxic constituents recently adopted by the NMWQCC and upheld in the New Mexico Court of Appeals should be used as surface water screening levels in the future.

LANL Response:
Noted.

21. Section 6.2.1.1 Scoping, Screening and Problem Formulation, pg. 6-10:

NMED Comment:
The Permittees' response to this comment is not adequate. NMED's comment requested that the Permittees discuss the impact of using an older version of ECORisk (Version 1.2) in lieu of more recent versions of the program (it is noted that since the drafting of NMED's comments, a new release, Version 2.0, of ECORisk has been released for review). The Permittees' response was simply a printout of the data tables contained in ECORisk, versions 1.2, 1.3, 1.4, and 1.5. This is not acceptable. The Permittees must provide a clear discussion as to whether any toxicity reference values for any of the constituents of potential concern (COPCs) have been updated. As the version of ECORisk that was applied is now four versions out-of-date, the Permittees must revise the risk assessment to be based on ECORisk 1.5 values, or Version 2.0 if this version has been approved for use.

LANL Response:
The combination of exceeding screening criteria and the lack of screening criteria for known contaminants in the canyon resulted in the design and performance of a baseline ecological risk assessment for Cañon de Valle. The design of the risk assessment was conducted in a teaming fashion with NMED. That assessment, based upon empirical studies to identify adverse ecological effects in the canyon, was designed and executed with NMED and DOE input. Conducting and documenting a baseline ecological risk assessment obviates the need to compare versions of ecological screening levels between the time when the Problem Formulation was conducted and today. None-the-less, information is provided below to characterize the differences in ecological screening levels (ESLs) for the 40 chemicals of potential ecological concern (COPECs) that came through the selection process described above.

The contaminant concentrations used to obtain the hazard quotients (HQs) were provided in Tables L-1 and L-2 in Appendix L, as revised to address the December 2003 NOD. The following steps were taken to identify the analytes for which ESL comparisons are made between the most recent EcoRisk database and the version that was contemporary at the time the Problem Formulation.

1. The Problem Formulation that was provided as an attachment to Appendix L documents all of the analytes measured in various media at the time that the ecological screening assessment was conducted. Table 1 of the Problem Formulation is "Cañon de Valle Ecological Risk Screening Assessment, All Detects for All media." That table lists 90 analytes. Inclusion in the table means that the analyte was detected at least once in one media.

2. There are 14 radionuclides in the list of 90 analytes. Thirteen of them were eliminated in the Phase II RFI as not associated with the facilities and within the ranges of background and fallout concentrations. Cesium-137 in sediment is eliminated in the Problem Formulation because only one value exceeded sediment background. The maximum cesium-137 value is well below the lowest ESL screening criterion.

3. There are 16 analytes that are detected at a rate of less that 5% for each media. The list of analytes is: benzoic acid, benzyl alcohol, bromomethane, butanone, chlorophenol, total cyanide, di-n-octylphthalate, dinitro-2-methylphenol, dinitrobenzene, fluoranthene, methylene chloride, nitrobenzene, nitrotoluene, phenol, pyrene, and tetryl. These analytes are eliminated.

4. As described in Section 2.4 of Attachment 1 to Appendix L, there were 7 organic chemicals identified in the Problem Formulation that are eliminated due to low numbers of detections and very low concentrations.

5. There are 10 anions, cations and essential nutrients in water that are not RCRA contaminants. Examples include calcium, chlorate, chloride and sulfate. They are eliminated.

6. Potassium is the one common analyte in soil and sediment that does not exceed background. Potassium is eliminated.

7. Cesium and rubidium were collected in three and four water samples, respectively. These data were used for geochemical analysis of water and do not represent contaminants in the environment. They are eliminated.

The steps above result in a total of 40 COPECs that are compared to ESLs from EcoRisk database version from 2000 and the most current version as of this writing, Version 2.0a.

Lists of COPECs

The ESL comparisons are conducted by general media categories based on each media's cohort of receptors. The media categories are soil, sediment, and water. The soil receptors are generic plant, generic invertebrate, robin as insectivore, robin as herbivore, robin as omnivore, kestrel as carnivore, kestrel as omnivore, cottontail, mouse, shrew, and fox. The sediment receptors are swallow, bat and generic aquatic community exposed to sediments. For the water exposure pathway the receptors are robin, kestrel, deer mouse, cottontail, shrew, fox, swallow, bat, and the generic aquatic community. Each COPEC in the list of 40 may be a COPEC for any or all of the media types. In order to be a COPEC for a particular media, it has to be detected at least once in that media. Tables 1, 2, and 3 provide the lists of COPECs for soil, sediment and water, and the ESLs that were used at the time of the Problem Formulation (2000). These tables also list the ESLs from Version 2.0a (2004) of the EcoRisk Database. Tables 4, 5, and 6 are comparisons for the ESLs from 2000 and 2004. Each entry in the latter tables is the ratio of the 2000 ESL to the 2004 ESL. If the value is greater than 1.0 then the 2004 ESL value is smaller than the 2000 ESL.

Soil ESL Comparisons

Values that are greater than 2.0 are bolded in Table 4 to draw attention to present-day ESLs that are less than half of the values used in 2000. The pattern that emerges is that antimony, barium, boron, cadmium, chromium, copper, lead, mercury, nickel, silver, vanadium and zinc have lower ESLs in the present version of ESLs across many of the receptors. Of these, barium, copper, lead, and silver were already COPECs.

Four of the analytes, antimony, chromium, mercury, and vanadium have maximum values that are below their respective LANL background values. Some ESLs for these four analytes are exceeded, but these ESLs are also below the LANL background values. Cadmium has a single value out of 30 (10 detects) samples that exceeds the shrew ESL. The low rates of detection combined with a single value exceeding a single ESL indicates that the cadmium concentrations in Cañon de Valle do not pose a chronic exposure risk. The plant ESL is the only one that is exceeded for nickel. The 95% upper confidence limit on the mean nickel concentration is 16.5 mg/kg, well below the plant ESL of 20 mg/kg. These results indicate the nickel would not be carried forward as a COPEC in a screening ecological risk assessment.

Some of the ESLs in the most recent database are larger values than the 2000 values. With the current values, deer mouse exposure to RDX in soil would be eliminated as contaminant-to-receptor combination of potential concern.

The only two analytes that might have been added as COPECs due to the 2004 ESLs are boron and zinc. Their inclusion would not have changed the study design because analysis for metals in small mammal samples was part of the design. Additionally, if any other contaminant was causing an adverse ecological effect in the canyon, the small mammal population studies were designed to detect that effect.

Sediment ESL Comparisons

Values that are greater than 2.0 are bolded in Table 5 to draw attention to present-day ESLs that are less than half of the values used in 2000. The ESLs that changed to lower values are cadmium, chromium, copper, lead, mercury, silver, and zinc. Of these copper, lead, and silver are already COPECs. The maximum value for cadmium exceeds the sediment ESLs. However, cadmium is a water COPEC and is therefore addressed in the aquatic study design. The maximum value for zinc is lower than the sediment. ESLs that are greater than the LANL background value. The maximum value for chromium in sediment

does not exceed any of the sediment ESLs. With the current values, silver exposure to swallow and HMX exposure to bat would be dropped as contaminant-to-receptor combinations of potential concern. Mercury is the only analyte that exceeds ESLs that was not included in the original Problem Formulation list of COPECs for sediment. The aquatic study design would not have been changed with the addition of mercury as a COPEC because the target analyte list of metals, including mercury, was quantified in sediment samples are part of the field study. The field studies were designed to detect adverse effects due to any contaminant in sediments.

Water ESL Comparisons

Values that are greater than 2.0 are bolded in Table 6 to draw attention to present-day ESLs that are less than half of the values used in 2000. The ESLs that changed to lower values are barium, chromium, cobalt, copper, lead, mercury, and nickel. Of these, barium and cobalt are already COPECs in water. The maximum values for chromium and mercury do not exceed any of the ESLs. The maximum values for copper, lead, and nickel exceed the aquatic community criteria only. Copper and lead are sediment COPECs and are therefore addressed by the aquatic study design. The current ESLs would not have dropped any of the contaminant-to-receptor combinations identified in the Problem Formulation. The aquatic study design would not have been changed by the inclusion of nickel as a COPEC because the target analyte list of metals, including mercury, was quantified in water samples are part of the field study. The field studies were designed to detect adverse effects due to any contaminant in water.

Attachment 2 General Comments:

3. *The response to the comment is not adequate. The comment requested tables that clearly indicate what values were applied from the ECORisk database, each toxicity reference value for each receptor species, and the concentrations used to obtain the HQs for species. The response provided by LANL was a printout of the entire database, which contains data for several constituents that are not COPCs. This is not acceptable. The tables must be revised and should specifically address the COPCs and the associated toxicity data. The Permittees must revise the report accordingly.*

LANL Response:
Refer to Specific Comment 21 for more information. The ecological risk assessment (Appendix L) will be revised to reflect the information provided above and in the attached Appendix 2.

Appendix 1

RESRAD Input and Output

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+01 12
Time = 3.000E+01 13
Time = 1.000E+02 14
Time = 3.000E+02 15
Time = 1.000E+03 16
Dose/Source Ratios Summed Over All Pathways 17
Single Radionuclide Soil Guidelines 17
Dose Per Nuclide Summed Over All Pathways 18
Soil Concentration Per Nuclide 18

Dose Conversion Factor (and Related) Parameter Summary
File: FGR 13 Morbidity

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Am-241	4.440E-01	4.440E-01	DCF2(1)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(2)
B-1	Ru-106+D	4.770E-04	4.770E-04	DCF2(3)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(4)
B-1	U-233	1.350E-01	1.350E-01	DCF2(5)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Am-241	3.640E-03	3.640E-03	DCF3(1)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(2)
D-1	Ru-106+D	2.740E-05	2.740E-05	DCF3(3)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(4)
D-1	U-233	2.890E-04	2.890E-04	DCF3(5)
D-34	Food transfer factors:			
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(1,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(1,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(1,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(2,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Ru-106+D , plant/soil concentration ratio, dimensionless	3.000E-02	3.000E-02	RTF(3,1)
D-34	Ru-106+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,2)
D-34	Ru-106+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.300E-06	3.300E-06	RTF(3,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(5,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(5,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(1,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(2,2)
D-5				
D-5	Ru-106+D , fish	1.000E+01	1.000E+01	BIOFAC(3,1)
D-5	Ru-106+D , crustacea and mollusks	3.000E+02	3.000E+02	BIOFAC(3,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(5,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(5,2)

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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	2.500E+01	---	BRDL
R011	Time since placement of material (yr)	1.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	8.000E-08	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ru-106	8.000E-08	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Am-241	4.320E+00	0.000E+00	0.000E+00	W1(1)
R012	Concentration in groundwater (pCi/L): Ru-106	2.040E+01	0.000E+00	0.000E+00	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
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)	1.500E+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	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+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	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.649E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ru-106				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E-01	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.294E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.556E-07	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.638E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	not used	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	not used	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	not used	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	not used	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	not used	1.500E-01	---	DM
R019	Depth of roots (m)	not used	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	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	8.894E+01	---	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	0.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	0.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Am-241	8.000E-08
Thickness:	10.00 meters	Ru-106	8.000E-08
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	2.668E-07	6.045E-07	3.546E-07	3.276E-09	1.844E-09	1.469E-09	2.212E-06	4.405E-07
M(t):	1.067E-08	2.418E-08	1.418E-08	1.310E-10	7.375E-11	5.877E-11	8.847E-08	1.762E-08

Maximum TDOSE(t): 2.828E-06 mrem/yr at t = 437.0 ± 0.9 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 4.370E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	4.941E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.941E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 4.370E+02 years

Water Dependent Pathways

Radio-Nuclide Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.828E-06	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.828E-06	1.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.828E-06	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.828E-06	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.032E-09	0.0076	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	3.919E-08	0.1469	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.123E-08	0.1545	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.032E-09	0.0076
Ru-106	2.256E-07	0.8455	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.648E-07	0.9924
Total	2.256E-07	0.8455	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.668E-07	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.026E-09	0.0034	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	1.686E-08	0.0279	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.889E-08	0.0312	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.026E-09	0.0034
Ru-106	5.856E-07	0.9688	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.025E-07	0.9966
Total	5.856E-07	0.9688	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.045E-07	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.013E-09	0.0057	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	3.122E-09	0.0088	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.134E-09	0.0145	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.013E-09	0.0057
Ru-106	3.494E-07	0.9855	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.525E-07	0.9943
Total	3.494E-07	0.9855	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.546E-07	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.967E-09	0.6005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	8.521E-12	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.976E-09	0.6031	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.967E-09	0.6005
Ru-106	1.300E-09	0.3969	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.309E-09	0.3995
Total	1.300E-09	0.3969	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.276E-09	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.844E-09	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	4.027E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.844E-09	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.844E-09	1.0000
Ru-106	6.138E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.179E-17	0.0000
Total	6.138E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.844E-09	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radicnuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	1.469E-09	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.469E-09	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.469E-09	1.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.469E-09	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	7.689E-10	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.689E-10	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	2.211E-06	0.9997	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.212E-06	1.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.211E-06	0.9997	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.212E-06	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	8.294E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	8.294E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	4.404E-07	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.405E-07	1.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.404E-07	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.405E-07	1.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction*	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	2.540E-02	2.532E-02	2.516E-02	2.459E-02	2.304E-02	1.835E-02	2.765E+01	5.506E+00
Am-241	Np-237	1.000E+00	1.011E-07	3.030E-07	7.046E-07	2.089E-06	5.869E-06	1.724E-05	1.308E-04	6.091E-04
Am-241	U-233	1.000E+00	1.888E-16	1.320E-15	6.960E-15	6.168E-14	5.064E-13	5.012E-12	1.457E-08	6.803E-07
Am-241	Th-229	1.000E+00	5.059E-18	7.582E-17	8.828E-16	2.325E-14	5.570E-13	1.856E-11	4.091E-10	8.520E-09
Am-241	∑DSR(j)		2.540E-02	2.532E-02	2.516E-02	2.459E-02	2.305E-02	1.837E-02	2.765E+01	5.507E+00
Ru-106	Ru-106	1.000E+00	3.310E+00	7.531E+00	4.407E+00	1.636E-02	7.723E-10	1.765E-35	0.000E+00	0.000E+00

*Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Am-241	9.841E+02	9.873E+02	9.937E+02	1.017E+03	1.085E+03	1.361E+03	9.043E-01	4.540E+00
Ru-106	7.553E+00	3.320E+00	5.673E+00	1.528E+03	3.237E+10	*3.347E+15	*3.347E+15	*3.347E+15

*At specific activity limit

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 = 437.0 ± 0.9 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	8.000E-08	437.0 ± 0.9	3.535E+01	7.071E-01	3.535E+01	7.071E-01
Ru-106	8.000E-08	1.121 ± 0.002	7.565E+00	3.305E+00	0.000E+00	*3.347E+15

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	2.032E-09	2.026E-09	2.013E-09	1.967E-09	1.843E-09	1.468E-09	2.212E-06	4.405E-07
Np-237	Am-241	1.000E+00	8.092E-15	2.424E-14	5.637E-14	1.671E-13	4.695E-13	1.379E-12	1.046E-11	4.873E-11
U-233	Am-241	1.000E+00	1.511E-23	1.056E-22	5.568E-22	4.935E-21	4.051E-20	4.010E-19	1.166E-15	5.442E-14
Th-229	Am-241	1.000E+00	4.047E-25	6.066E-24	7.063E-23	1.860E-21	4.456E-20	1.485E-18	3.273E-17	6.816E-16
Ru-106	Ru-106	1.000E+00	2.648E-07	6.025E-07	3.525E-07	1.309E-09	6.179E-17	0.000E+00	0.000E+00	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	8.000E-08	7.974E-08	7.922E-08	7.744E-08	7.256E-08	5.779E-08	3.015E-08	3.093E-09
Np-237	Am-241	1.000E+00	0.000E+00	2.587E-14	7.734E-14	2.548E-13	7.392E-13	2.197E-12	4.853E-12	6.967E-12
U-233	Am-241	1.000E+00	0.000E+00	5.658E-20	5.079E-19	5.590E-18	4.898E-17	4.962E-16	3.470E-15	1.799E-14
Th-229	Am-241	1.000E+00	0.000E+00	1.782E-24	4.801E-23	1.765E-21	4.669E-20	1.611E-18	3.580E-17	7.309E-16
Ru-106	Ru-106	1.000E+00	8.000E-08	3.442E-08	6.372E-09	1.739E-11	8.219E-19	1.822E-44	0.000E+00	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

RESCALC.EXE execution time = 1.82 seconds

Appendix 2

Supplemental Tables

LIST OF CONTENTS FOR APPENDIX 2
PHASE III RFI REPORT
SWMU 16-021(c)-99

The following tables represent responses in accordance with the NMED comments.

Table 1	Soil Ecological Screening Levels
Table 2	Sediment Ecological Screening Levels
Table 3	Water Ecological Screening Levels
Table 4	Soil Ratios of Problem Formulation ESLs to 2004 ESLs
Table 5	Sediment Ratios of Problem Formulation ESLs to 2004 ESLs
Table 6	Water Ratios of Problem Formulation ESLs to 2004 ESLs

Table 1
Soil Ecological Screening Levels (mg/kg)

Chemical	Plant		Invertebrate		Robin Invertivore		Robin Omnivore		Robin Herbivore		Kestrel Omnivore		Kestrel Carnivore		Cottontail		Mouse		Shrew		Fox	
	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004
Aluminum	5	NA[1]	NA[1]	NA	280	NA	520	NA	3000	NA	2100	NA	51000	NA	740	NA	18	NA	8.8	NA	1300	NA
Amino-2,6-dinitrotoluene[4-]	80	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7	5.8	4.2	3.6	5.7	5.7	1400	930
Amino-4,6-dinitrotoluene[2-]	80	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	8.4	6.1	5.3	8.3	8.3	2000	1300
Antimony	0.5	0.05	NA	78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	2.9	1	0.48	0.57	0.27	89	46
Arsenic	10	10	6.8	6.8	13	19	23	32	100	100	99	140	2300	2400	21	21	1.1	1.7	0.57	0.83	87	97
Barium	1000	100	NA	330	54	190	88	300	230	820	400	1400	10000	36000	310	3300	42	440	23	230	3700	41000
Beryllium	1	2.5	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200	170	6.2	5	3	2.4	470	410
Boron	5.7	36	NA	NA	120	7.5	210	3.2	1200	2	890	56	22000	1400	8800	77	260	56	120	120	20000	21000
Cadmium	1	29	10	150	5.9	0.83	6.1	1.5	6.3	10	45	5.9	720	770	18	22	8.4	1.2	7.2	0.67	730	570
Chromium, Total	3.1	2.4	NA	1.4	960	460	1100	550	1500	680	9100	5300	32000	13000	320000	8000	91000	2100	42000	700	1200000	18000
Cobalt	2.5	13	NA	NA	0.51	19	0.71	35	1.1	170	3.8	140	40	2300	5	1800	1.3	69	0.91	33	74	3900
Copper	100	10	13	13	380	24	210	20	140	16	3200	210	16000	1400	150	130	100	76	160	75	6800	3900
HMX	NA	NA	NA	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1	51	1	43	10	260	2200	37000
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	20	210	100	1700	78	16	66	21	57	30	970	140	1900	800	750	930	470	220	280	100	5900	4600
Manganese	5	50	NA	NA	3900	3900	930	4200	520	4600	32000	32000	250000	290000	150	1700	130	720	520	520	29000	34000
Mercury, inorganic	34	34	0.05	0.05	1.1	0.15	1.1	0.22	1.1	0.38	7.8	1.1	16	3.1	130	250	64	44	60	20	1000	450
Nickel	20	20	100	100	460	270	560	340	730	460	3700	2700	35000	10000	1900	8700	640	2300	420	980	27000	34000
RDX	100	100	NA	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.1	10	5.1	8.2	23	29	5100	4400
Silver	0.2	0.05	NA	NA	2.8	14	1.3	19	0.89	30	23	100	130	2400	180	490	130	130	250	86	11000	14000
Trinitrotoluene[2,4,6-]	3	80	0.3	NA	NA	17	NA	8.3	NA	5.5	NA	120	NA	2600	80	77	56	53	100	100	25000	16000
Vanadium	0.25	0.025	NA	NA	2.9	2.8	5.4	5.1	30	28	22	21	510	510	760	790	20	20	9.6	9.6	1400	1500
Zinc	10	10	85	190	100	30	41	42	25	67	700	200	860	1500	1100	910	860	250	2000	180	19000	11000

[1] Not Available

Table 2
Sediment Ecological Screening Levels (mg/kg)

Chemical	Swallow		Bat		Aquatic Community	
	2000	2004	2000	2004	2000	2004
Acetone	170	600	50	50	NA	0.065
Aluminum	400	400	12	12	58000	58000
Amino-2,6-dinitrotoluene[4-]	NA	NA[1]	7.6	7.5	NA	NA
Amino-4,6-dinitrotoluene[2-]	NA	NA	11	11	NA	NA
Arsenic	19	29	0.79	1.1	12	12
Barium	77	270	32	320	48	48
Beryllium	NA	NA	4.1	3.3	NA	NA
Bis(2-ethylhexyl)phthalate	1.3	1.3	39	38	NA	NA
Cadmium	9	1.1	10	0.84	0.59	0.59
Chromium, Total	2200	1600	93000	2300	56	56
Cobalt	0.74	28	1.2	45	NA	NA
Copper	700	46	290	130	28	28
Di-n-butylphthalate	0.18	0.24	1500	3800	11	11
HMX	NA	NA	14	350	NA	NA
Iron	NA	NA	NA	NA	20	NA
Lead	350	33	1200	200	34	34
Manganese	6700	6700	860	850	720	720
Mercuryin	1.6	0.29	83	36	0.13	0.13
Nickel	760	680	660	2200	39	39
RDX	NA	NA	31	39	NA	NA
Selenium	1.6	1.6	1.2	1.2	1	1
Silver	5.1	20	440	110	1	1
Thallium	NA[1]	NA	0.046	0.044	NA	NA
Toluene	NA	NA	93	92	0.67	0.67
Trinitrotoluene[2,4,6-]	NA	23	140	140	NA	NA
Uranium	30	290	38	38	NA	NA
Vanadium	4.2	4.1	13	13	NA	NA
Zinc	180	41	3300	230	150	150

[1] Not Available

Table 3
Water Ecological Screening Levels (µg/L)

Chemical	Robin		Kestrel		Deermouse		Cottontail		Shrew		Fox		Swallow		Bat		Aquatic Community	
	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004	2000	2004
Antimony	NA[1]	1400000	NA	1600000	650	52000	1200	100000	560	44000	1400	110000	NA	830000	780	62000	100	11000
Acetone	400000	780000	470000	910000	52000	10000	100000	19000	44000	8600	110000	22000	230000	450000	62000	12000	11000	87
Aluminum	780000	NA[1]	910000	NA	10000	10000	19000	19000	8600	8600	22000	22000	450000	NA	12000	12000	87	NA
Amino-2,6-dinitrotoluene[4-]	NA	NA	NA	NA	10000	14000	19000	28000	8600	12000	22000	32000	NA	NA	12000	17000	NA	NA
Amino-4,6-dinitrotoluene[2-]	NA	NA	NA	NA	14000	810	28000	1500	12000	690	32000	1700	NA	NA	17000	960	NA	100
Arsenic	36000	36000	42000	42000	660	660	1200	1200	560	560	1400	1400	21000	21000	790	790	150	150
Barium	140000	650000	170000	760000	26000	7200	52000	14000	22000	6100	59000	16000	85000	380000	32000	8600	3.8	3.8
Beryllium	NA	NA	NA	NA	3400	3400	6800	6800	2900	2900	7600	7600	NA	NA	4100	4100	5.3	5.3
Bis(2-ethylhexyl)phthalate	7800	7800	9100	9100	96000	96000	180000	180000	82000	82000	210000	210000	4500	4500	110000	110000	32	32
Boron	330000	380000	380000	440000	140000	140000	280000	280000	120000	120000	320000	320000	190000	220000	170000	170000	540	540
Cadmium	10000	10000	12000	12000	5200	5600	10000	11000	4400	4800	11000	12000	5900	5900	6200	6700	1.3	0.15
Chromium, Total	550000	190000	640000	220000	10000000	120000	19000000	230000	8600000	100000	22000000	260000	320000	100000	12000000	140000	11	77
Cobalt	1400	140	1600	160	1000	100	2000	200	890	89	2300	230	820	82	1200	120	3	3
Copper	330000	21000	390000	25000	61000	26000	120000	52000	52000	22000	130000	59000	190000	12000	73000	32000	5	5
Dinitrotoluene[2,4-]	NA	NA	NA	NA	2800	2800	5500	5500	2400	2400	6200	6200	NA	NA	3300	3300	310	310
Fluoride	55000	87000	65000	100000	140000	140000	270000	270000	110000	110000	300000	300000	32000	50000	160000	160000	1600	1600
HMX	NA	NA	NA	NA	15000	390000	30000	770000	13000	330000	34000	870000	NA	NA	18000	470000	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1000	NA
Lead	27000	110000	32000	130000	42000	5100	82000	10000	35000	4300	93000	11000	15000	64000	50000	6100	1.2	1.2
Lithium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14	NA
Manganese	4100000	4100000	4700000	4800000	230000	230000	450000	450000	190000	190000	510000	510000	2300000	2400000	270000	270000	80	80
Mercuryin	3200	130	3700	150	69000	7400	130000	14000	59000	6300	150000	16000	1800	78	83000	8800	1.3	0.77
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	230	NA
Nickel	550000	200000	640000	230000	210000	360	410000	710	170000	300	460000	800	310000	110000	250000	430	28	28
Nitrotoluene[2-]	NA	NA	NA	NA	9400	9400	18000	18000	8000	8000	20000	20000	NA	NA	11000	11000	NA	NA
RDX	NA	NA	NA	NA	36000	52000	72000	100000	31000	44000	81000	110000	NA	NA	44000	62000	NA	NA
Selenium	3100	3100	3600	3600	1000	1000	2000	2000	890	890	2300	2300	1800	1800	1200	1200	2	5
Silver	2400	38000	2800	45000	93000	100000	180000	190000	79000	85000	200000	220000	1400	22000	110000	110000	0.36	0.36
Strontium	NA	NA	NA	NA	120000	130000	250000	250000	110000	110000	280000	290000	NA	NA	150000	150000	620	620
Tetrachloroethene	NA	NA	NA	NA	7300	10000	14000	20000	6200	8900	16000	23000	NA	NA	8800	12000	120	120
Thallium	NA	NA	NA	NA	38	37	76	73	33	31	86	82	NA	NA	46	44	18	18
Titanium	NA	NA	NA	NA	83000	83000	160000	160000	70000	70000	180000	180000	NA	NA	99000	99000	NA	NA
Toluene	NA	NA	NA	NA	130000	130000	260000	260000	110000	110000	300000	300000	NA	NA	160000	160000	130	130
Trichloroethene	NA	NA	NA	NA	3600	520000	7200	1000000	3100	440000	8100	1100000	NA	NA	4400	620000	35	350
Trinitrobenzene[1,3,5-]	NA	NA	NA	NA	35000	70000	69000	130000	30000	60000	78000	150000	NA	NA	42000	84000	NA	NA
Trinitrotoluene[2,4,6-]	NA	69000	NA	81000	180000	180000	350000	350000	150000	150000	400000	400000	NA	40000	210000	210000	NA	NA
Uranium	59000	550000	69000	650000	32000	32000	62000	62000	27000	27000	70000	70000	34000	320000	38000	38000	1.8	1.8
Vanadium	8100	7800	9500	9100	11000	11000	21000	21000	9400	9400	24000	24000	4700	4500	13000	13000	19	19
Zinc	100000	850000	120000	1000000	840000	660000	1600000	1200000	710000	560000	1800000	1400000	59000	490000	1000000	790000	66	66

[1] Not Available

Table 4
Soil Ratios of Problem Formulation ESLs to 2004 ESLs

Chemical	Plant	Invertebrate	Robin Invertivore	Robin Omnivore	Robin Herbivore	Kestrel Omnivore	Kestrel Carnivore	Cottontail	Mouse	Shrew	Fox
Aluminum	NA[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Amino-2,6-dinitrotoluene[4-]	1	NA	NA	NA	NA	NA	NA	1.21	1.17	1	1.51
Amino-4,6-dinitrotoluene[2-]	1	NA	NA	NA	NA	NA	NA	1.19	1.15	1	1.54
Antimony	**10**	NA	NA	NA	NA	NA	NA	**2.07**	**2.08**	**2.11**	1.93
Arsenic	1	1	0.684	0.719	1	0.707	0.958	1	0.647	0.687	0.897
Barium	**10**	NA	0.284	0.293	0.28	0.286	0.278	0.0939	0.0955	0.1	0.0902
Beryllium	0.4	NA	NA	NA	NA	NA	NA	1.18	1.24	1.25	1.15
Boron	0.158	NA	**16**	**65.6**	**600**	**15.9**	**15.7**	**114**	**4.64**	1	0.952
Cadmium	0.0345	0.0667	**7.11**	**4.07**	0.63	**7.63**	0.935	0.818	**7**	**10.7**	1.28
Chromium, Total	1.29	NA	**2.09**	2	**2.21**	1.72	**2.46**	**40**	**43.3**	**60**	**66.7**
Cobalt	0.192	NA	0.0268	0.0203	0.00647	0.0271	0.0174	0.00278	0.0188	0.0276	0.019
Copper	**10**	1	**15.8**	**10.5**	**8.75**	**15.2**	**11.4**	1.15	1.32	**2.13**	1.74
HMX	NA	NA	NA	NA	NA	NA	NA	0.0216	0.0233	0.0385	0.0595
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0952	0.0588	**4.88**	**3.14**	1.9	**6.93**	**2.38**	0.806	**2.14**	**2.8**	1.28
Manganese	0.1	NA	1	0.221	0.113	1	0.862	0.0882	0.181	1	0.853
Mercury, inorganic	1	1	**7.33**	**5**	**2.89**	**7.09**	**5.16**	0.52	1.45	**3**	**2.22**
Nickel	1	1	1.7	1.65	1.59	1.37	**3.5**	0.218	0.278	0.429	0.794
RDX	**1**	NA	NA	NA	NA	NA	NA	0.61	0.622	0.793	1.16
Silver	**4**	NA	0.2	0.0684	0.0297	0.23	0.0542	0.367	1	**2.91**	0.786
Trinitrotoluene[2,4,6-]	0.0375	NA	NA	NA	NA	NA	NA	1.04	1.06	1	1.56
Vanadium	**10**	NA	1.04	1.06	1.07	1.05	1	0.962	1	1	0.933
Zinc	1	0.447	**3.33**	0.976	0.373	**3.5**	0.573	1.21	**3.44**	**11.1**	1.73

[1] Not Available

Bold Values = Ratios Greater than 2

Table 5
Sediment Ratios of Problem Formulation ESLs to 2004 ESLs

Chemical	Swallow	Bat	Aquatic Community
Acetone	0.283	1	NA
Aluminum	1	1	1
Amino-2,6-dinitrotoluene[4-]	NA[1]	1.01	NA
Amino-4,6-dinitrotoluene[2-]	NA	1	NA
Arsenic	0.655	0.718	1
Barium	0.285	0.1	1
Beryllium	NA	1.24	NA
Bis(2-ethylhexyl)phthalate	1	1.03	NA
Cadmium	**8.18**	**11.9**	1
Chromium, Total	1.38	**40.4**	1
Cobalt	0.0264	0.0267	NA
Copper	**15.2**	**2.23**	1
Di-n-butylphthalate	0.75	0.395	1
HMX	NA	0.04	NA
Iron	NA	NA	NA
Lead	**10.6**	**6**	1
Manganese	1	1.01	1
Mercuryin	**5.52**	**2.31**	1
Nickel	1.12	0.3	1
RDX	NA	0.795	NA
Selenium	1	1	1
Silver	0.255	**4**	1
Thallium	NA	1.05	NA
Toluene	NA	1.01	1
Trinitrotoluene[2,4,6-]	NA	1	NA
Uranium	0.103	1	NA
Vanadium	1.02	1	NA
Zinc	**4.39**	**14.3**	1

[1] Not Available

Bold Values = Ratios Greater than 2

Table 6
Water Ratios of Problem Formulation ESLs to 2004 ESLs

Chemical	Robin	Kestrel	Deermouse	Cottontail	Shrew	Fox	Swallow	Bat	Aquatic Community
Acetone	0.286	0.294	1	1	1	1	0.277	1	1
Aluminum	1	1	1	1	1	1	1	1	1
Amino-2,6-dinitrotoluene[4-]	NA[1]	NA	1	1	1	1	NA	1	NA
Amino-4,6-dinitrotoluene[2-]	NA	NA	1	1	1	1	NA	1	NA
Antimony	NA	NA	0.802	0.8	0.812	0.824	NA	0.812	1
Arsenic	1	1	1	1	1	1	1	1	1
Barium	0.215	0.224	**3.61**	**3.71**	**3.61**	**3.69**	0.224	**3.72**	1
Beryllium	NA	NA	1	1	1	1	NA	1	1
Bis(2-ethylhexyl)phthalate	1	1	1	1	1	1	1	1	1
Boron	0.868	0.864	1	1	1	1	0.864	1	1
Cadmium	1	1	0.929	0.909	0.917	0.917	1	0.925	**8.67**
Chromium, Total	2.89	**2.91**	**83.3**	**82.6**	**86**	**84.6**	**3.2**	**85.7**	0.143
Cobalt	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	1
Copper	**15.7**	**15.6**	**2.35**	**2.31**	**2.36**	**2.2**	**15.8**	**2.28**	1
Dinitrotoluene[2,4-]	NA	NA	1	1	1	1	NA	1	1
Fluoride	0.632	0.65	1	1	1	1	0.64	1	1
HMX	NA	NA	0.0385	0.039	0.0394	0.0391	NA	0.0383	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.245	0.246	**8.24**	**8.2**	**8.14**	**8.45**	0.234	**8.2**	1
Lithium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1	0.979	1	1	1	1	0.958	1	1
Mercury, inorganic	**24.6**	**24.7**	**9.32**	**9.29**	**9.37**	**9.38**	**23.1**	**9.43**	1.69
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	**2.75**	**2.78**	**583**	**577**	**567**	**575**	**2.82**	**581**	1
Nitrotoluene[2-]	NA	NA	1	1	1	1	NA	1	NA
RDX	NA	NA	0.692	0.72	0.705	0.736	NA	0.71	NA
Selenium	1	1	1	1	1	1	1	1	0.4
Silver	0.0632	0.0622	0.93	0.947	0.929	0.909	0.0636	1	1
Strontium	NA	NA	0.923	1	1	0.966	NA	1	1
Tetrachloroethene	NA	NA	0.73	0.7	0.697	0.696	NA	0.733	1
Thallium	NA	NA	1.03	1.04	1.06	1.05	NA	1.05	1
Titanium	NA	NA	1	1	1	1	NA	1	NA
Toluene	NA	NA	1	1	1	1	NA	1	1
Trichloroethene	NA	NA	0.00692	0.0072	0.00705	0.00736	NA	0.0071	0.1
Trinitrobenzene[1,3,5-]	NA	NA	0.5	0.531	0.5	0.52	NA	0.5	NA

Table 6
Water Ratios of Problem Formulation ESLs to 2004 ESLs

Chemical	Robin	Kestrel	Deermouse	Cottontail	Shrew	Fox	Swallow	Bat	Aquatic Community
Trinitrotoluene[2,4,6-]	NA	NA	1	1	1	1	NA	1	NA
Uranium	0.107	0.106	1	1	1	1	0.106	1	1
Vanadium	1.04	1.04	1	1	1	1	1.04	1	1
Zinc	0.118	0.12	1.27	1.33	1.27	1.29	0.12	1.27	1

[1] Not Available

Bold Values = Ratios Greater than 2