Technical Support Document

TSD 14-011

Soil Area Factors

Revision 0

Originator: (signature on file) Date: 12/16/14
Robert F. Decker

Reviewer: (signature on file) Date: 12/16/14
Dave Fauver

Approval: (signature on file) Date: 12/18/14
Robert F. Yetter

Summary of Changes in this Revision:

- Rev. 0 –Initial issuance.

TABLE OF CONTENTS

LIST OF TABLES

1. PURPOSE

The purpose of this technical support document (TSD) is to establish the soil area actors (AF) for surface and subsurface soils, and for use in other applications such as the Buried Piping dose assessment in TSD 14-015*, "Buried Piping Dose Modeling and Derived Concentrations Guideline Levels"* (Reference 1) for the Zion Station Restoration Project (ZSRP).

2. DISCUSSION

TSD 11-001, *"Potential Radionuclides of Concern During the Decommissioning of the Zion Station"* (Reference 2) and TSD-14-019, *"Radionuclides of Concern for Soil and Basement Fill Model Source Terms"* (Reference 3) evaluated Industry Guidance Documents, Zion characterization data select an initial suite of 26 radionuclides potentially present at the Zion Nuclear Power Station (ZNPS) at the time of license termination and the radionuclide mixture associated with the initial suite radionuclides. TSD 14-019 then evaluated the initial suite to determine which radionuclides were insignificant dose contributors in accordance with NUREG 1757, Volume 2, Revision 1, *Consolidated Decommissioning Guidance Characterizations, Survey, and Determination of Radiological Criteria* (Reference 4) guidance to determine the set of Radionuclides of Concern (ROC) that will be subject to detailed dose assessment. The five ROCs for soil are:

- Co-60
- Cs-134
- Cs-137
- Ni-63
- Sr-90

The site-specific surface and subsurface soil DCGLs were determined in TSD 14-010, "*RESRAD Dose Assessment for Basement Fill Model and Soil"* (Reference 5) using the RESidual RADioactivity Materials Code 7.0 (RESRAD 7.0). The RESRAD input parameters for the soil DCGL calculations are provided in TSD 14-010, Attachment 9. Surface soil is defined as a 0.15 m contaminated zone thickness from the surface. Subsurface soil is defined as a 1.0 m contaminated zone thickness from the surface.

The RESRAD parameters used for the soil DCGL modeling are also used to determine AFs with two required modifications. First, the "Contaminated fractions" for plant food meat and milk were set to 1.0 for the soil DCGL modeling. This was required because the food ingestion rate parameters used represent the intakes for food grown onsite as opposed to national diet parameters. However, this parameter must be changed to -1 to allow RESRAD to adjust the food intake values in proportion to the contaminated area which ranges from 10,000 m^2 to 0.01 m^2 in the AF RESRAD runs. Changing the contaminated fractions parameter to -1 slightly lowers the base case value (i.e., that corresponding to the full 64,500 m^2 area used in the soil DCGL modeling) due to RESRAD allowing a maximum of 50% for intake from the onsite garden. However, using this slightly lower value as the base case in the AF calculations is appropriate because the AFs are relative values and it is conservative because using the soil DCGL values as the base case would incorrectly result in higher calculated AFs. The second parameter modification required was the "length parallel to aquifer flow" which was adjusted for each contaminated area value used for AF determination. The "length parallel to aquifer flow" was calculated as the diameter of the assumed circular source area for each area modeled for AFs.

3. SURFACE AND SUBSURFACE AREA FACTORS

For each radionuclide, all dose pathways were calculated assuming an initial concentration of 1 pCi/g. The RESRAD Default modeling for soil assumes a large source term area of 10,000 m^2; ZSRP is assuming a much larger source term area of 64,500 m^2. The ratio of the dose from the full source term area to the dose from a smaller area is defined as the AF. For the source term area of 64,500 m^2, the AF for all radionuclides is equal to one. Area Factors for other size areas were computed by taking the ratio of the dose per unit concentration calculated by RESRAD for the 64,500 m^2 source term area for 0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30, 100, 300, 1000, 3000 and 10000 m^2. Isolated areas of contamination that are smaller than 64,500 m^2 will have a lower dose.

Area Factors are calculated using RESRAD for each ROC and for source area sizes ranging from 0.01 m^2 up to the full 64,500 m^2. The RESRAD Summary Reports and AF calculations are provided in Attachments 1 through 4.

The calculated AFs will be used to adjust soil $DCGL_W$ to estimate soil $DCGL_{EMC}$ and the minimum detectable concentration (MDC) and/or investigation level for scanning in Class 1 survey units.

Hence, $$DCGL_{EMC} = DCGL_W * AF_m$$

Where, AF_m = the magnitude by which the residual radioactivity in a small area of elevated activity can exceed the $DCGL_W$ while maintaining compliance with the release criterion (surface and subsurface DCGLs). The $DCGL_{EMC}$ is used to set investigation levels and multiple small areas of elevated activity require additional evaluation in accordance with the guidance and formulation found in Sections 5.5.2.6 and 8.5.2 of NUREG 1575 Rev.1, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (Reference 6).

The Surface Soil and Subsurface Soil Area Factors are listed in Tables 1 and 2. The RESRAD Runs for the 64,500 m^2 surface areas for both surface and subsurface soils are provided as a complete run in Attachments 1 and 3, respectively. For the remaining RESRAD runs, since the only change was for the contamination area/zone and the length parallel to flow, only page 18 displaying the dose in mrem/yr is provided in Attachments 2 and 4, respectively. AFs for other areas are determined by linear interpolation using the AFs listed in Tables 1 and 2.

Table 1– Surface Soil Area Factors

Area (m^2)	Area Factors for Radionuclides of Concern				
	Cs-137	**Co-60**	**Cs-134**	**Ni-63**	**Sr-90**
0.01	1.50E+03	1.23E+03	1.33E+03	3.31E+05	8.40E+04
0.03	4.98E+02	4.09E+02	4.42E+02	1.76E+05	3.03E+04
0.1	1.50E+02	1.23E+02	1.33E+02	6.92E+04	8.52E+03
0.3	4.98E+01	4.09E+01	4.42E+01	2.57E+04	2.88E+03
1	1.50E+01	1.23E+01	1.33E+01	8.06E+03	8.90E+02
3	6.46E+00	5.24E+00	5.73E+00	2.73E+03	3.13E+02
10	3.06E+00	2.47E+00	2.72E+00	8.23E+02	1.03E+02
30	2.10E+00	1.68E+00	1.86E+00	2.75E+02	4.02E+01
100	1.62E+00	1.29E+00	1.44E+00	8.26E+01	1.64E+01
300	1.46E+00	1.16E+00	1.30E+00	2.75E+01	6.14E+00
1,000	1.33E+00	1.08E+00	1.20E+00	8.26E+00	1.88E+00
3,000	1.26E+00	1.05E+00	1.16E+00	4.68E+00	1.72E+00
10,000	1.13E+00	1.02E+00	1.08E+00	1.86E+00	1.33E+00
64,500	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Table 2– Subsurface Soil Area Factors

Area (m^2)	Area Factors for Radionuclides of Concern				
	Cs-137	**Co-60**	**Cs-134**	**Ni-63**	**Sr-90**
0.01	2.04E+03	1.10E+03	1.52E+03	5.16E+05	1.45E+05
0.03	6.80E+02	3.65E+02	5.08E+02	1.98E+05	4.95E+04
0.1	2.04E+02	1.10E+02	1.52E+02	6.30E+04	1.50E+04
0.3	6.80E+01	3.65E+01	5.08E+01	2.14E+04	5.01E+03
1	2.04E+01	1.10E+01	1.52E+01	6.49E+03	1.50E+03
3	9.26E+00	4.91E+00	6.92E+00	2.17E+03	5.23E+02
10	4.48E+00	2.36E+00	3.35E+00	6.51E+02	1.64E+02
30	3.23E+00	1.70E+00	2.42E+00	2.17E+02	5.72E+01
100	2.59E+00	1.37E+00	1.95E+00	6.51E+01	1.76E+01
300	2.29E+00	1.26E+00	1.77E+00	2.17E+01	5.92E+00
1,000	1.90E+00	1.16E+00	1.56E+00	6.52E+00	1.78E+00
3,000	1.72E+00	1.13E+00	1.46E+00	4.12E+00	1.65E+00
10,000	1.32E+00	1.07E+00	1.22E+00	1.80E+00	1.30E+00
64,500	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

4. CONCLUSION

This TSD calculates surface and subsurface soil AFs for the ZNPS ROCs using RESRAD. The input parameters were the same as used to calculate soil DCGL with minor adjustments required to evaluates the smaller source areas. The resulting AFs are provided in Tables 1 and 2.

5. REFERENCES

5.1. Zion*Solutions* Technical Support Document (TSD) 14-015, "Buried Piping Dose Modeling and Derived Concentration Guideline Levels" – December 2014.

5.2. Zion*Solutions* Technical Support Document (TSD) 11-001, "Potential Radionuclides of Concern During the Decommissioning of the Zion Station" – October 2012.

5.3. Zion*Solutions* Technical Support Document (TSD) 14-019, "Radionuclides of Concern for Soil and Basement Fill Model Source Terms" – December 2014.

5.4. NUREG-1757 Vol. 2, Rev. 1, Consolidated Decommissioning Guidance Characterizations, Survey, and Determiation of Radiological Criteria, September 2006.

5.5. Zion*Solutions* Technical Support Document (TSD) 14-010, "RESRAD Dose Modeling for Basement Fill Model and Soil DCGL and Calculation of Basement Fill Model Dose Factors" – December 2014.

5.6. NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).

6. ATTACHMENTS

6.1. Attachment 1 - RESRAD Run to Determine Surface Soil Area Factors for 64,500 m^2 Contamination Area

6.2. Attachment 2 – Summary of RESRAD Runs Used to Determine Area Factors for Remaining Surface Soil Contamination Areas

6.3. Attachment 3 – RESRAD Run to Determine Subsurface Soil Area Factors for 64,500 m^2 Contamination Area

6.4. Attachment 4 – Summary of RESRAD Runs Used to Determine Area Factors for Remaining Subsurface Soil Contamination Areas

ATTACHMENT 1

RESRAD Run for to Determine Surface Soil Area Factors for 64,500 m^2 Contamination Area

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 1
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 2
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: Surface Soil DCGL Plus FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(2)
A-1	Cs-134 (Source: FGR 12)	9.472E+00	9.472E+00	DCF1(3)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(4)
A-1	Ni-63 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(5)
A-1	Sr-90 (Source: FGR 12)	7.043E-04	7.043E-04	DCF1(6)
A-1	Y-90 (Source: FGR 12)	2.391E-02	2.391E-02	DCF1(7)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Co-60	2.190E-04	2.190E-04	DCF2(1)
B-1	Cs-134	4.620E-05	4.620E-05	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	Ni-63	6.290E-06	6.290E-06	DCF2(4)
B-1	Sr-90+D	1.308E-03	1.300E-03	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-134	7.330E-05	7.330E-05	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	Ni-63	5.770E-07	5.770E-07	DCF3(4)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(5)
D-34	Food transfer factors:			
D-34	Co-60 , plant/soil concentration ratio, dimensionless	1.500E-01	8.000E-02	RTF(1,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.800E-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				
D-34	Cs-134 , plant/soil concentration ratio, dimensionless	7.800E-02	4.000E-02	RTF(2,1)
D-34	Cs-134 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	6.500E-02	3.000E-02	RTF(2,2)
D-34	Cs-134 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.400E-02	8.000E-03	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	7.800E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	6.500E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.400E-02	8.000E-03	RTF(3,3)
D-34				
D-34	Ni-63 , plant/soil concentration ratio, dimensionless	9.200E-02	5.000E-02	RTF(4,1)
D-34	Ni-63 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Ni-63 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.200E-02	2.000E-02	RTF(4,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	5.900E-01	3.000E-01	RTF(5,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(5,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.700E-03	2.000E-03	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				
D-5	Cs-134 , fish	2.000E+03	2.000E+03	BIOFAC(2,1)
D-5	Cs-134 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 3
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: Surface Soil DCGL Plus FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Ni-63 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Ni-63 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(5,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(5,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 4
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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)	6.450E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	2.870E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Cs-134	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ni-63	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(5)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Cs-134	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ni-63	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(5)
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)	1.800E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.500E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	6.600E-02	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.880E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	9.700E-01	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.200E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	8.300E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.900E-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)	1.800E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.500E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.900E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	6.600E-02	2.000E-01	---	FCSZ

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 5
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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 conductivity (m/yr)	2.880E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	3.900E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.300E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.250E+03	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	3.450E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.800E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.500E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.900E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	6.600E-02	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	9.700E-01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.880E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.022E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Cs-134				
R016	Contaminated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.929E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.929E-03	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)	6.200E+01	1.000E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.200E+01	1.000E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.200E+01	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.912E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.076E-01	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 6
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.350E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	5.500E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.490E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.240E-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)	1.120E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	2.140E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	2.330E+02	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.510E+01	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)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.780E+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	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 7
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	2.830E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	6.520E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.060E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	6.000E+01	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)	4.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	1.220E+00	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)	1.750E+00	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	2.900E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.900E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	2.460E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	1.230E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.200E-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	3.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	3.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	3.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	3.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	5.800E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	3.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	3.300E+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
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	1.000E+00	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)

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 8
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	512	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	17	---	---	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	suppressed
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 9
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

Contaminated Zone Dimensions

Area:	64500.00 square meters
Thickness:	0.15 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g

Co-60	1.000E+00
Cs-134	1.000E+00
Cs-137	1.000E+00
Ni-63	1.000E+00
Sr-90	1.000E+00

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):	1.126E+01	9.115E+00	6.338E+00	2.631E+00	7.227E-01	1.614E-06	0.000E+00	4.878E-08
M(t):	4.502E-01	3.646E-01	2.535E-01	1.052E-01	2.891E-02	6.457E-08	0.000E+00	1.951E-09

Maximum TDOSE(t): 1.126E+01 mrem/yr at t = 0.000E+00 years

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 10
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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	5.102E+00	0.4533	1.962E-06	0.0000	0.000E+00	0.0000	3.085E-02	0.0027	9.682E-02	0.0086	1.991E-02	0.0018	3.546E-04	0.0000
Cs-134	2.813E+00	0.2499	3.750E-07	0.0000	0.000E+00	0.0000	3.962E-02	0.0035	2.023E-01	0.0180	2.275E-01	0.0202	8.758E-04	0.0001
Cs-137	1.182E+00	0.1050	3.013E-07	0.0000	0.000E+00	0.0000	3.145E-02	0.0028	1.605E-01	0.0143	1.806E-01	0.0160	6.951E-04	0.0001
Ni-63	0.000E+00	0.0000	5.937E-08	0.0000	0.000E+00	0.0000	4.280E-04	0.0000	1.515E-04	0.0000	5.241E-03	0.0005	8.017E-06	0.0000
Sr-90	6.969E-03	0.0006	9.709E-06	0.0000	0.000E+00	0.0000	5.795E-01	0.0515	1.645E-01	0.0146	4.093E-01	0.0364	1.669E-03	0.0001
Total	9.103E+00	0.8088	1.241E-05	0.0000	0.000E+00	0.0000	6.819E-01	0.0606	6.242E-01	0.0555	8.426E-01	0.0749	3.602E-03	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 = 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	5.250E+00	0.4664
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.283E+00	0.2917
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	1.555E+00	0.1381
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	5.829E-03	0.0005
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	1.162E+00	0.1032
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	1.126E+01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 $T_{½}$ Limit = 30 days 12/05/2014 16:08 Page 11
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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-	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	4.457E+00	0.4889	1.701E-06	0.0000	0.000E+00	0.0000	2.675E-02	0.0029	8.396E-02	0.0092	1.727E-02	0.0019	3.075E-04	0.0000
Cs-134	2.003E+00	0.2197	2.649E-07	0.0000	0.000E+00	0.0000	2.799E-02	0.0031	1.429E-01	0.0157	1.607E-01	0.0176	6.186E-04	0.0001
Cs-137	1.150E+00	0.1262	2.909E-07	0.0000	0.000E+00	0.0000	3.037E-02	0.0033	1.550E-01	0.0170	1.744E-01	0.0191	6.712E-04	0.0001
Ni-63	0.000E+00	0.0000	5.727E-08	0.0000	0.000E+00	0.0000	4.128E-04	0.0000	1.462E-04	0.0000	5.056E-03	0.0006	7.732E-06	0.0000
Sr-90	4.090E-03	0.0004	5.648E-06	0.0000	0.000E+00	0.0000	3.377E-01	0.0371	9.622E-02	0.0106	2.396E-01	0.0263	9.708E-04	0.0001
Total	7.614E+00	0.8353	7.962E-06	0.0000	0.000E+00	0.0000	4.232E-01	0.0464	4.782E-01	0.0525	5.970E-01	0.0655	2.576E-03	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 = 1.000E+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	4.585E+00	0.5030
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.335E+00	0.2562
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	1.511E+00	0.1657
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	5.623E-03	0.0006
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	6.786E-01	0.0745
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	9.115E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 12
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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-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.
Co-60	3.400E+00	0.5364	1.278E-06	0.0000	0.000E+00	0.0000	2.011E-02	0.0032	6.310E-02	0.0100	1.298E-02	0.0020	2.311E-04	0.0000
Cs-134	1.015E+00	0.1602	1.321E-07	0.0000	0.000E+00	0.0000	1.396E-02	0.0022	7.124E-02	0.0112	8.015E-02	0.0126	3.085E-04	0.0000
Cs-137	1.090E+00	0.1720	2.712E-07	0.0000	0.000E+00	0.0000	2.830E-02	0.0045	1.445E-01	0.0228	1.625E-01	0.0256	6.256E-04	0.0001
Ni-63	0.000E+00	0.0000	5.326E-08	0.0000	0.000E+00	0.0000	3.839E-04	0.0001	1.359E-04	0.0000	4.702E-03	0.0007	7.191E-06	0.0000
Sr-90	1.409E-03	0.0002	1.911E-06	0.0000	0.000E+00	0.0000	1.142E-01	0.0180	3.255E-02	0.0051	8.105E-02	0.0128	3.284E-04	0.0001
Total	5.507E+00	0.8688	3.645E-06	0.0000	0.000E+00	0.0000	1.770E-01	0.0279	3.115E-01	0.0491	3.414E-01	0.0539	1.501E-03	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-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.
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	3.496E+00	0.5517
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.181E+00	0.1863
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	1.426E+00	0.2250
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	5.230E-03	0.0008
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	2.296E-01	0.0362
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	6.338E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 13
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.316E+00	0.5001	4.689E-07	0.0000	0.000E+00	0.0000	7.376E-03	0.0028	2.315E-02	0.0088	4.761E-03	0.0018	8.478E-05	0.0000
Cs-134	9.393E-02	0.0357	1.153E-08	0.0000	0.000E+00	0.0000	1.218E-03	0.0005	6.218E-03	0.0024	6.996E-03	0.0027	2.692E-05	0.0000
Cs-137	9.008E-01	0.3423	2.113E-07	0.0000	0.000E+00	0.0000	2.205E-02	0.0084	1.126E-01	0.0428	1.266E-01	0.0481	4.874E-04	0.0002
Ni-63	0.000E+00	0.0000	4.116E-08	0.0000	0.000E+00	0.0000	2.967E-04	0.0001	1.051E-04	0.0000	3.635E-03	0.0014	5.558E-06	0.0000
Sr-90	3.373E-05	0.0000	4.287E-08	0.0000	0.000E+00	0.0000	2.563E-03	0.0010	7.304E-04	0.0003	1.819E-03	0.0007	7.368E-06	0.0000
Total	2.310E+00	0.8781	7.757E-07	0.0000	0.000E+00	0.0000	3.351E-02	0.0127	1.428E-01	0.0543	1.438E-01	0.0547	6.120E-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+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.
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	1.351E+00	0.5135
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.084E-01	0.0412
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	1.162E+00	0.4418
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	4.042E-03	0.0015
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	5.154E-03	0.0020
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	2.631E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 14
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

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	8.508E-02	0.1177	2.572E-08	0.0000	0.000E+00	0.0000	4.046E-04	0.0006	1.270E-03	0.0018	2.612E-04	0.0004	4.650E-06	0.0000
Cs-134	1.021E-04	0.0001	1.046E-11	0.0000	0.000E+00	0.0000	1.105E-06	0.0000	5.641E-06	0.0000	6.347E-06	0.0000	2.442E-08	0.0000
Cs-137	5.102E-01	0.7059	9.969E-08	0.0000	0.000E+00	0.0000	1.041E-02	0.0144	5.312E-02	0.0735	5.977E-02	0.0827	2.300E-04	0.0003
Ni-63	0.000E+00	0.0000	1.899E-08	0.0000	0.000E+00	0.0000	1.369E-04	0.0002	4.847E-05	0.0001	1.677E-03	0.0023	2.564E-06	0.0000
Sr-90	7.739E-10	0.0000	8.020E-13	0.0000	0.000E+00	0.0000	4.797E-08	0.0000	1.367E-08	0.0000	3.404E-08	0.0000	1.379E-10	0.0000
Total	5.954E-01	0.8238	1.444E-07	0.0000	0.000E+00	0.0000	1.095E-02	0.0152	5.445E-02	0.0753	6.172E-02	0.0854	2.372E-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 = 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.
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	8.702E-02	0.1204
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.152E-04	0.0002
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	6.338E-01	0.8769
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	1.865E-03	0.0026
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	9.659E-08	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	7.227E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 15
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio-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.
Co-60	2.834E-14	0.0000	2.392E-21	0.0000	0.000E+00	0.0000	3.784E-13	0.0000	7.405E-12	0.0000	2.100E-12	0.0000	4.325E-19	0.0000
Cs-134	2.078E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.634E-22	0.0000	1.449E-20	0.0000	2.559E-20	0.0000	1.457E-27	0.0000
Cs-137	2.918E-10	0.0002	1.643E-17	0.0000	0.000E+00	0.0000	1.724E-08	0.0107	3.817E-07	0.2365	6.744E-07	0.4178	3.791E-14	0.0000
Ni-63	0.000E+00	0.0000	2.891E-18	0.0000	0.000E+00	0.0000	2.096E-10	0.0001	3.569E-10	0.0002	1.875E-08	0.0116	3.904E-16	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.982E-29	0.0000	1.100E-28	0.0000	3.059E-28	0.0000	0.000E+00	0.0000
Total	2.918E-10	0.0002	1.932E-17	0.0000	0.000E+00	0.0000	1.745E-08	0.0108	3.821E-07	0.2367	6.932E-07	0.4294	3.830E-14	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-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.
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	9.911E-12	0.0000
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.077E-20	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	1.074E-06	0.6651
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	1.932E-08	0.0120
Sr-90	3.981E-07	0.2466	0.000E+00	0.0000	0.000E+00	0.0000	1.936E-08	0.0120	3.530E-08	0.0219	6.854E-08	0.0425	5.213E-07	0.3229
Total	3.981E-07	0.2466	0.000E+00	0.0000	0.000E+00	0.0000	1.936E-08	0.0120	3.530E-08	0.0219	6.854E-08	0.0425	1.614E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 16
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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-	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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 17
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	1.622E-08	0.3325	0.000E+00	0.0000	0.000E+00	0.0000	6.520E-10	0.0134	8.594E-10	0.0176	3.105E-08	0.6365	4.878E-08	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	0.000E+00	0.0000
Total	1.622E-08	0.3325	0.000E+00	0.0000	0.000E+00	0.0000	6.520E-10	0.0134	8.594E-10	0.0176	3.105E-08	0.6365	4.878E-08	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 16:08 Page 18
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.250E+00	4.585E+00	3.496E+00	1.351E+00	8.702E-02	9.911E-12	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	3.283E+00	2.335E+00	1.181E+00	1.084E-01	1.152E-04	4.077E-20	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.555E+00	1.511E+00	1.426E+00	1.162E+00	6.338E-01	1.074E-06	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	5.829E-03	5.623E-03	5.230E-03	4.042E-03	1.865E-03	1.932E-08	0.000E+00	4.878E-08
Sr-90+D	Sr-90+D	1.000E+00	1.162E+00	6.786E-01	2.296E-01	5.154E-03	9.659E-08	5.213E-07	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.762E+00	5.453E+00	7.150E+00	1.850E+01	2.873E+02	2.522E+12	*1.113E+15	*1.113E+15
Cs-134	7.614E+00	1.071E+01	2.117E+01	2.306E+02	2.170E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.608E+01	1.655E+01	1.753E+01	2.151E+01	3.945E+01	2.328E+07	*8.593E+13	*8.593E+13
Ni-63	4.289E+03	4.446E+03	4.781E+03	6.185E+03	1.341E+04	1.294E+09	*5.586E+13	5.125E+08
Sr-90	2.152E+01	3.684E+01	1.089E+02	4.851E+03	2.588E+08	4.795E+07	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.250E+00	4.762E+00	5.250E+00	4.762E+00
Cs-134	1.000E+00	0.000E+00	3.283E+00	7.614E+00	3.283E+00	7.614E+00
Cs-137	1.000E+00	0.000E+00	1.555E+00	1.608E+01	1.555E+00	1.608E+01
Ni-63	1.000E+00	0.000E+00	5.829E-03	4.289E+03	5.829E-03	4.289E+03
Sr-90	1.000E+00	0.000E+00	1.162E+00	2.152E+01	1.162E+00	2.152E+01

RESRAD, Version 7.0 T½ Limit = 30 days 12/08/2014 16:08 Page 19
Summary : ZION Surface Soil 64500 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DOCL.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cs-134	Cs-134	1.000E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cs-137	Cs-137	1.000E+00	1.666E+00	1.611E+00	1.426E+00	1.162E+00	6.338E-01	[illegible]	[illegible]	[illegible]
Ni-63	Ni-63	1.000E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sr-90	Sr-90	1.000E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.000E+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cs-134	Cs-134	1.000E+00	1.000E+00	7.135E-01	3.632E-01	3.418E-02	3.991E-05	2.178E-15	9.808E-46	0.000E+00
Cs-137	Cs-137	1.000E+00	1.000E+00	9.784E-01	9.280E-01	7.793E-01	4.737E-01	8.286E-02	5.690E-04	1.527E-11
Ni-63	Ni-63	1.000E+00	1.000E+00	9.748E-01	9.248E-01	7.707E-01	4.578E-01	7.399E-02	4.044E-04	4.888E-12
Sr-90	Sr-90	1.000E+00	1.000E+00	5.876E-01	2.029E-01	4.908E-03	1.182E-07	8.114E-24	0.000E+00	0.000E+00

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

RESCALC.EXE execution time = 1.09 seconds

ATTACHMENT 2

Summary of RESRAD Runs Used to Determine Area Factors for Remaining Surface Soil Contamination Areas

RESRAD Run Page 18 for 0.01 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  18:13  Page  18
Summary : ZION Surface Soil 0.01 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

  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 1.000E+01 3.000E+01 1.000E+02 3.000E+02 1.000E+03
Co-60      Co-60      1.000E+00  4.281E-03 3.723E-03 2.814E-03 1.054E-03 6.160E-05 1.726E-17 0.000E+00 0.000E+00
Cs-134     Cs-134     1.000E+00  2.476E-03 1.754E-03 8.807E-04 7.876E-05 7.710E-08 3.302E-26 0.000E+00 0.000E+00
Cs-137+D   Cs-137+D   1.000E+00  1.040E-03 1.008E-03 9.458E-04 7.554E-04 3.855E-04 7.902E-13 0.000E+00 0.000E+00
Ni-63      Ni-63      1.000E+00  1.760E-08 1.697E-08 1.578E-08 1.220E-08 5.627E-09 1.165E-14 0.000E+00 5.629E-12
Sr-90+D    Sr-90+D    1.000E+00  1.384E-05 8.070E-06 2.740E-06 6.233E-08 1.221E-12 2.019E-20 0.000E+00 0.000E+00
The DSR includes contributions from associated (half-life < 30 days) 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
Co-60       5.839E+03  6.715E+03  8.884E+03  2.373E+04  4.058E+05 *1.113E+15 *1.113E+15 *1.113E+15
Cs-134      1.010E+04  1.425E+04  2.839E+04  3.174E+05  3.242E+08 *1.283E+15 *1.283E+15 *1.283E+15
Cs-137      2.403E+04  2.481E+04  2.643E+04  3.310E+04  6.485E+04  3.164E+13 *8.593E+13 *8.593E+13
Ni-63       1.421E+09  1.473E+09  1.584E+09  2.049E+09  4.443E+09 *5.586E+13 *5.586E+13  4.441E+12
Sr-90       1.807E+06  3.098E+06  9.123E+06  4.011E+08  2.047E+13 *1.366E+14 *1.366E+14 *1.366E+14
*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 = 0.000E+00 years

Nuclide  Initial      tmin        DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)
  (i)    (pCi/g)     (years)                   (pCi/g)               (pCi/g)
Co-60    1.000E+00   0.000E+00    4.281E-03  5.839E+03  4.281E-03  5.839E+03
Cs-134   1.000E+00   0.000E+00    2.476E-03  1.010E+04  2.476E-03  1.010E+04
Cs-137   1.000E+00   0.000E+00    1.040E-03  2.403E+04  1.040E-03  2.403E+04
Ni-63    1.000E+00   0.000E+00    1.760E-08  1.421E+09  1.760E-08  1.421E+09
Sr-90    1.000E+00   0.000E+00    1.384E-05  1.807E+06  1.384E-05  1.807E+06
```

RESRAD Run Page 18 for 0.03 m^2 Contamination Area

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 18:12 Page 18
Summary : ZION Surface Soil 0.03 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.284E-02	1.117E-02	8.442E-03	3.161E-03	1.848E-04	5.177E-17	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	7.426E-03	5.263E-03	2.642E-03	2.363E-04	2.313E-07	9.906E-26	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	3.120E-03	3.023E-03	2.837E-03	2.266E-03	1.156E-03	2.371E-12	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	3.311E-08	3.194E-08	2.970E-08	2.296E-08	1.059E-08	3.494E-14	0.000E+00	1.707E-11
Sr-90+D	Sr-90+D	1.000E+00	3.829E-05	2.234E-05	7.588E-06	1.728E-07	3.398E-12	6.056E-20	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.947E+03	2.239E+03	2.961E+03	7.909E+03	1.353E+05	*1.113E+15	*1.113E+15	*1.113E+15
Cs-134	3.366E+03	4.750E+03	9.462E+03	1.058E+05	1.081E+08	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	8.012E+03	8.269E+03	8.811E+03	1.103E+04	2.162E+04	1.055E+13	*8.593E+13	*8.593E+13
Ni-63	7.550E+08	7.827E+08	8.417E+08	1.089E+09	2.361E+09	*5.586E+13	*5.586E+13	1.464E+12
Sr-90	6.529E+05	1.119E+06	3.295E+06	1.447E+08	7.356E+12	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.284E-02	1.947E+03	1.284E-02	1.947E+03
Cs-134	1.000E+00	0.000E+00	7.426E-03	3.366E+03	7.426E-03	3.366E+03
Cs-137	1.000E+00	0.000E+00	3.120E-03	8.012E+03	3.120E-03	8.012E+03
Ni-63	1.000E+00	0.000E+00	3.311E-08	7.550E+08	3.311E-08	7.550E+08
Sr-90	1.000E+00	37.62 ± 0.08	4.083E-05	6.123E+05	3.829E-05	6.529E+05

RESRAD Run Page 18 for 0.1 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  16:10  Page  18
Summary : ZION Surface Soil 0.1 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

  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 1.000E+01 3.000E+01 1.000E+02 3.000E+02 1.000E+03
Co-60       Co-60     1.000E+00 4.281E-02 3.723E-02 2.814E-02 1.054E-02 6.160E-04 1.726E-16 0.000E+00 0.000E+00
Cs-134      Cs-134    1.000E+00 2.475E-02 1.754E-02 8.807E-03 7.875E-04 7.710E-07 3.302E-25 0.000E+00 0.000E+00
Cs-137+D    Cs-137+D  1.000E+00 1.040E-02 1.008E-02 9.458E-03 7.554E-03 3.855E-03 7.902E-12 0.000E+00 0.000E+00
Ni-63       Ni-63     1.000E+00 8.425E-08 8.127E-08 7.558E-08 5.842E-08 2.695E-08 1.165E-13 0.000E+00 5.804E-11
Sr-90+D     Sr-90+D   1.000E+00 1.234E-04 7.198E-05 2.445E-05 5.571E-07 1.098E-11 2.029E-19 0.000E+00 0.000E+00
The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60       5.840E+02  6.716E+02  8.884E+02  2.373E+03  4.059E+04 *1.113E+15 *1.113E+15 *1.113E+15
Cs-134      1.010E+03  1.425E+03  2.839E+03  3.174E+04  3.242E+07 *1.283E+15 *1.283E+15 *1.283E+15
Cs-137      2.404E+03  2.481E+03  2.643E+03  3.310E+03  6.485E+03  3.164E+12 *8.593E+13 *8.593E+13
Ni-63       2.967E+08  3.076E+08  3.308E+08  4.280E+08  9.277E+08 *5.586E+13 *5.586E+13  4.307E+11
Sr-90       2.026E+05  3.473E+05  1.022E+06  4.487E+07  2.278E+12 *1.366E+14 *1.366E+14 *1.366E+14
*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 = 0.000E+00 years

Nuclide  Initial      tmin          DSR(i,tmin)  G(i,tmin)  DSR(i,tmax)  G(i,tmax)
  (i)    (pCi/g)     (years)                    (pCi/g)                 (pCi/g)
Co-60    1.000E+00   0.000E+00     4.281E-02  5.840E+02  4.281E-02  5.840E+02
Cs-134   1.000E+00   0.000E+00     2.475E-02  1.010E+03  2.475E-02  1.010E+03
Cs-137   1.000E+00   0.000E+00     1.040E-02  2.404E+03  1.040E-02  2.404E+03
Ni-63    1.000E+00   0.000E+00     8.425E-08  2.967E+08  8.425E-08  2.967E+08
Sr-90    1.000E+00   37.62 ± 0.08  1.361E-04  1.836E+05  1.234E-04  2.026E+05
```

RESRAD Run Page 18 for 0.3 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  18:09  Page  18
Summary : ZION Surface Soil 0.3 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.284E-01	1.117E-01	8.442E-02	3.161E-02	1.848E-03	5.177E-16	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	7.426E-02	5.263E-02	2.642E-02	2.363E-03	2.313E-06	9.906E-25	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	3.120E-02	3.023E-02	2.837E-02	2.266E-02	1.156E-02	2.371E-11	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	2.272E-07	2.191E-07	2.038E-07	1.575E-07	7.267E-08	3.494E-13	0.000E+00	1.293E-10
Sr-90+D	Sr-90+D	1.000E+00	3.659E-04	2.135E-04	7.253E-05	1.653E-06	3.256E-11	6.232E-19	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.947E+02	2.239E+02	2.961E+02	7.910E+02	1.353E+04	*1.113E+15	*1.113E+15	*1.113E+15
Cs-134	3.366E+02	4.750E+02	9.462E+02	1.058E+04	1.081E+07	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	8.012E+02	8.269E+02	8.811E+02	1.103E+03	2.162E+03	1.055E+12	*8.593E+13	*8.593E+13
Ni-63	1.100E+08	1.141E+08	1.227E+08	1.587E+08	3.440E+08	*5.586E+13	*5.586E+13	1.933E+11
Sr-90	6.832E+04	1.171E+05	3.447E+05	1.513E+07	7.673E+11	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.284E-01	1.947E+02	1.284E-01	1.947E+02
Cs-134	1.000E+00	0.000E+00	7.426E-02	3.366E+02	7.426E-02	3.366E+02
Cs-137	1.000E+00	0.000E+00	3.120E-02	8.012E+02	3.120E-02	8.012E+02
Ni-63	1.000E+00	0.000E+00	2.272E-07	1.100E+08	2.272E-07	1.100E+08
Sr-90	1.000E+00	37.66 ± 0.08	4.026E-04	6.210E+04	3.659E-04	6.832E+04

RESRAD Run Page 18 for 1.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T½ Limit = 30 days         12/05/2014  16:07  Page  18
Summary : ZION Surface Soil 1.0 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.281E-01	3.722E-01	2.814E-01	1.054E-01	6.159E-03	1.726E-15	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	2.475E-01	1.754E-01	8.806E-02	7.875E-03	7.710E-06	3.302E-24	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.040E-01	1.008E-01	9.457E-02	7.553E-02	3.855E-02	7.903E-11	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	7.233E-07	6.977E-07	6.489E-07	5.015E-07	2.314E-07	1.165E-12	0.000E+00	2.365E-10
Sr-90+D	Sr-90+D	1.000E+00	1.214E-03	7.085E-04	2.407E-04	5.485E-06	1.081E-10	2.176E-18	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	5.840E+01	6.716E+01	8.885E+01	2.373E+02	4.059E+03	*1.113E+15	*1.113E+15	*1.113E+15
Cs-134	1.010E+02	1.425E+02	2.839E+02	3.175E+03	3.243E+06	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.404E+02	2.481E+02	2.643E+02	3.310E+02	6.486E+02	3.164E+11	*8.593E+13	*8.593E+13
Ni-63	3.456E+07	3.583E+07	3.853E+07	4.985E+07	1.080E+08	2.147E+13	*5.586E+13	1.057E+11
Sr-90	2.059E+04	3.529E+04	1.039E+05	4.558E+06	2.312E+11	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.281E-01	5.840E+01	4.281E-01	5.840E+01
Cs-134	1.000E+00	0.000E+00	2.475E-01	1.010E+02	2.475E-01	1.010E+02
Cs-137	1.000E+00	0.000E+00	1.040E-01	2.404E+02	1.040E-01	2.404E+02
Ni-63	1.000E+00	0.000E+00	7.233E-07	3.456E+07	7.233E-07	3.456E+07
Sr-90	1.000E+00	37.76 ± 0.08	1.303E-03	1.918E+04	1.214E-03	2.059E+04

RESRAD Run Page 18 for 3.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days        12/05/2014  18:06  Page  18
Summary : ZION Surface Soil 3 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.002E+00	8.719E-01	6.595E-01	2.476E-01	1.459E-02	4.676E-15	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	5.730E-01	4.062E-01	2.041E-01	1.830E-02	1.806E-05	9.526E-24	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	2.408E-01	2.334E-01	2.192E-01	1.755E-01	9.041E-02	2.317E-10	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	2.137E-06	2.061E-06	1.917E-06	1.482E-06	6.835E-07	3.494E-12	0.000E+00	4.010E-10
Sr-90+D	Sr-90+D	1.000E+00	3.233E-03	1.886E-03	6.407E-04	1.459E-05	2.871E-10	7.076E-18	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	2.494E+01	2.867E+01	3.791E+01	1.010E+02	1.713E+03	*1.113E+15	*1.113E+15	*1.113E+15
Cs-134	4.363E+01	6.154E+01	1.225E+02	1.366E+03	1.383E+06	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.038E+02	1.071E+02	1.141E+02	1.424E+02	2.765E+02	1.079E+11	*8.593E+13	*8.593E+13
Ni-63	1.170E+07	1.213E+07	1.304E+07	1.687E+07	3.658E+07	7.156E+12	*5.586E+13	6.235E+10
Sr-90	7.734E+03	1.325E+04	3.902E+04	1.713E+06	8.707E+10	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.002E+00	2.494E+01	1.002E+00	2.494E+01
Cs-134	1.000E+00	0.000E+00	5.730E-01	4.363E+01	5.730E-01	4.363E+01
Cs-137	1.000E+00	0.000E+00	2.408E-01	1.038E+02	2.408E-01	1.038E+02
Ni-63	1.000E+00	0.000E+00	2.137E-06	1.170E+07	2.137E-06	1.170E+07
Sr-90	1.000E+00	37.96 ± 0.08	3.718E-03	6.724E+03	3.233E-03	7.734E+03

RESRAD Run Page 18 for 10.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  16:04  Page  18
Summary : ZION Surface Soil 10 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	2.124E+00	1.848E+00	1.398E+00	5.254E-01	3.107E-02	1.308E-14	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	1.209E+00	8.573E-01	4.309E-01	3.868E-02	3.835E-05	2.993E-23	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	5.081E-01	4.926E-01	4.628E-01	3.710E-01	1.918E-01	7.466E-10	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	7.079E-06	6.828E-06	6.350E-06	4.908E-06	2.264E-06	1.165E-11	0.000E+00	7.433E-10
Sr-90+D	Sr-90+D	1.000E+00	9.062E-03	5.287E-03	1.794E-03	4.073E-05	7.930E-10	2.750E-17	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.177E+01	1.353E+01	1.788E+01	4.758E+01	8.045E+02	*1.113E+15	*1.113E+15	*1.113E+15
Cs-134	2.068E+01	2.916E+01	5.802E+01	6.463E+02	6.519E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	4.920E+01	5.075E+01	5.402E+01	6.738E+01	1.304E+02	3.349E+10	*8.593E+13	*8.593E+13
Ni-63	3.532E+06	3.661E+06	3.937E+06	5.093E+06	1.104E+07	2.147E+12	*5.586E+13	3.363E+10
Sr-90	2.759E+03	4.729E+03	1.394E+04	6.139E+05	3.153E+10	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	2.124E+00	1.177E+01	2.124E+00	1.177E+01
Cs-134	1.000E+00	0.000E+00	1.209E+00	2.068E+01	1.209E+00	2.068E+01
Cs-137	1.000E+00	0.000E+00	5.081E-01	4.920E+01	5.081E-01	4.920E+01
Ni-63	1.000E+00	0.000E+00	7.079E-06	3.532E+06	7.079E-06	3.532E+06
Sr-90	1.000E+00	0.000E+00	9.062E-03	2.759E+03	9.062E-03	2.759E+03

RESRAD Run Page 18 for 30.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T½ Limit = 30 days         12/05/2014  18:03  Page  18
Summary : ZION Surface Soil 30 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

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

  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 1.000E+01 3.000E+01 1.000E+02 3.000E+02 1.000E+03
Co-60       Co-60     1.000E+00 3.133E+00 2.728E+00 2.067E+00 7.813E-01 4.706E-02 3.294E-14 0.000E+00 0.000E+00
Cs-134      Cs-134    1.000E+00 1.765E+00 1.253E+00 6.307E-01 5.699E-02 5.772E-05 8.529E-23 0.000E+00 0.000E+00
Cs-137+D    Cs-137+D  1.000E+00 7.421E-01 7.200E-01 6.777E-01 5.470E-01 2.887E-01 2.176E-09 0.000E+00 0.000E+00
Ni-63       Ni-63     1.000E+00 2.119E-05 2.044E-05 1.901E-05 1.470E-05 6.779E-06 3.494E-11 0.000E+00 1.298E-09
Sr-90+D     Sr-90+D   1.000E+00 2.264E-02 1.321E-02 4.477E-03 1.013E-04 1.949E-09 1.074E-16 0.000E+00 0.000E+00
The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60        7.979E+00   9.164E+00   1.209E+01   3.200E+01   5.313E+02   7.590E+14  *1.113E+15  *1.113E+15
Cs-134       1.416E+01   1.996E+01   3.964E+01   4.387E+02   4.332E+05  *1.283E+15  *1.283E+15  *1.283E+15
Cs-137       3.369E+01   3.472E+01   3.689E+01   4.571E+01   8.659E+01   1.149E+10  *8.593E+13  *8.593E+13
Ni-63        1.180E+06   1.223E+06   1.315E+06   1.701E+06   3.688E+06   7.155E+11  *5.586E+13   1.926E+10
Sr-90        1.104E+03   1.893E+03   5.584E+03   2.469E+05   1.283E+10  *1.366E+14  *1.366E+14  *1.366E+14
*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 = 0.000E+00 years

Nuclide  Initial      tmin        DSR(i,tmin) G(i,tmin) DSR(i,tmax) G(i,tmax)
  (i)    (pCi/g)     (years)                   (pCi/g)               (pCi/g)
Co-60    1.000E+00   0.000E+00    3.133E+00  7.979E+00  3.133E+00  7.979E+00
Cs-134   1.000E+00   0.000E+00    1.765E+00  1.416E+01  1.765E+00  1.416E+01
Cs-137   1.000E+00   0.000E+00    7.421E-01  3.369E+01  7.421E-01  3.369E+01
Ni-63    1.000E+00   0.000E+00    2.119E-05  1.180E+06  2.119E-05  1.180E+06
Sr-90    1.000E+00  39.00 ± 0.08  2.885E-02  8.666E+02  2.264E-02  1.104E+03
```

RESRAD Run Page 18 for 100.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  16:01  Page  18
Summary : ZION Surface Soil 100 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.080E+00	3.556E+00	2.701E+00	1.029E+00	6.362E-02	9.637E-14	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	2.275E+00	1.616E+00	8.159E-01	7.441E-02	7.750E-05	2.746E-22	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	9.578E-01	9.305E-01	8.780E-01	7.151E-01	3.881E-01	7.116E-09	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	7.059E-05	6.809E-05	6.332E-05	4.894E-05	2.258E-05	1.165E-10	0.000E+00	2.397E-09
Sr-90+D	Sr-90+D	1.000E+00	6.661E-02	3.884E-02	1.316E-02	2.965E-04	5.634E-09	6.305E-16	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	6.127E+00	7.030E+00	9.254E+00	2.428E+01	3.929E+02	2.594E+14	*1.113E+15	*1.113E+15
Cs-134	1.099E+01	1.547E+01	3.064E+01	3.360E+02	3.226E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.610E+01	2.687E+01	2.847E+01	3.496E+01	6.441E+01	3.513E+09	*8.593E+13	*8.593E+13
Ni-63	3.542E+05	3.672E+05	3.948E+05	5.108E+05	1.107E+06	2.147E+11	*5.586E+13	1.043E+10
Sr-90	3.753E+02	6.436E+02	1.900E+03	8.433E+04	4.437E+09	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.080E+00	6.127E+00	4.080E+00	6.127E+00
Cs-134	1.000E+00	0.000E+00	2.275E+00	1.099E+01	2.275E+00	1.099E+01
Cs-137	1.000E+00	0.000E+00	9.578E-01	2.610E+01	9.578E-01	2.610E+01
Ni-63	1.000E+00	0.000E+00	7.059E-05	3.542E+05	7.059E-05	3.542E+05
Sr-90	1.000E+00	0.000E+00	6.661E-02	3.753E+02	6.661E-02	3.753E+02

RESRAD Run Page 18 for 300.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days         12/05/2014  17:59  Page  18
Summary : ZION Surface Soil 300 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.527E+00	3.950E+00	3.006E+00	1.153E+00	7.266E-02	2.703E-13	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	2.519E+00	1.791E+00	9.059E-01	8.315E-02	8.830E-05	8.103E-22	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.065E+00	1.036E+00	9.789E-01	8.022E-01	4.436E-01	2.116E-08	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	2.117E-04	2.042E-04	1.899E-04	1.468E-04	6.772E-05	3.494E-10	0.000E+00	4.282E-09
Sr-90+D	Sr-90+D	1.000E+00	1.892E-01	1.103E-01	3.732E-02	8.391E-04	1.581E-08	5.276E-15	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	5.522E+00	6.329E+00	8.317E+00	2.168E+01	3.441E+02	9.249E+13	*1.113E+15	*1.113E+15
Cs-134	9.926E+00	1.396E+01	2.760E+01	3.006E+02	2.831E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.347E+01	2.414E+01	2.554E+01	3.116E+01	5.635E+01	1.182E+09	*8.593E+13	*8.593E+13
Ni-63	1.181E+05	1.224E+05	1.316E+05	1.703E+05	3.692E+05	7.155E+10	*5.586E+13	5.839E+09
Sr-90	1.322E+02	2.267E+02	6.698E+02	2.979E+04	1.581E+09	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.527E+00	5.522E+00	4.527E+00	5.522E+00
Cs-134	1.000E+00	0.000E+00	2.519E+00	9.926E+00	2.519E+00	9.926E+00
Cs-137	1.000E+00	0.000E+00	1.065E+00	2.347E+01	1.065E+00	2.347E+01
Ni-63	1.000E+00	0.000E+00	2.117E-04	1.181E+05	2.117E-04	1.181E+05
Sr-90	1.000E+00	0.000E+00	1.892E-01	1.322E+02	1.892E-01	1.322E+02

RESRAD Run Page 18 for 1,000.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days        12/05/2014  17:57  Page  18
Summary : ZION Surface Soil 1,000 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.871E+00	4.252E+00	3.241E+00	1.249E+00	7.986E-02	8.717E-13	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	2.737E+00	1.947E+00	9.858E-01	9.082E-02	9.748E-05	2.680E-21	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.173E+00	1.141E+00	1.079E+00	8.871E-01	4.949E-01	7.022E-08	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	7.057E-04	6.807E-04	6.330E-04	4.893E-04	2.257E-04	1.165E-09	0.000E+00	8.522E-09
Sr-90+D	Sr-90+D	1.000E+00	6.165E-01	3.594E-01	1.216E-01	2.730E-03	5.121E-08	1.776E-13	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life < 30 days) 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
Co-60	5.133E+00	5.879E+00	7.715E+00	2.001E+01	3.130E+02	2.868E+13	*1.113E+15	*1.113E+15
Cs-134	9.136E+00	1.284E+01	2.536E+01	2.753E+02	2.565E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.132E+01	2.192E+01	2.317E+01	2.818E+01	5.052E+01	3.560E+08	*8.593E+13	*8.593E+13
Ni-63	3.543E+04	3.673E+04	3.949E+04	5.110E+04	1.108E+05	2.146E+10	*5.586E+13	2.934E+09
Sr-90	4.055E+01	6.957E+01	2.056E+02	9.157E+03	4.882E+08	*1.366E+14	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.871E+00	5.133E+00	4.871E+00	5.133E+00
Cs-134	1.000E+00	0.000E+00	2.737E+00	9.136E+00	2.737E+00	9.136E+00
Cs-137	1.000E+00	0.000E+00	1.173E+00	2.132E+01	1.173E+00	2.132E+01
Ni-63	1.000E+00	0.000E+00	7.057E-04	3.543E+04	7.057E-04	3.543E+04
Sr-90	1.000E+00	0.000E+00	6.165E-01	4.055E+01	6.165E-01	4.055E+01

RESRAD Run Page 18 for 3,000.0 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/05/2014  17:51  Page  18
Summary : ZION Surface Soil 3,000 m^2 120514
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.987E+00	4.355E+00	3.320E+00	1.282E+00	8.233E-02	1.825E-12	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	2.834E+00	2.017E+00	1.021E+00	9.413E-02	1.012E-04	6.690E-21	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.230E+00	1.196E+00	1.132E+00	9.301E-01	5.190E-01	1.759E-07	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	1.245E-03	1.201E-03	1.117E-03	8.632E-04	3.983E-04	3.075E-09	0.000E+00	1.726E-08
Sr-90+D	Sr-90+D	1.000E+00	6.740E-01	3.930E-01	1.330E-01	2.986E-03	5.600E-08	3.108E-11	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	5.013E+00	5.741E+00	7.530E+00	1.950E+01	3.037E+02	1.370E+13	*1.113E+15	*1.113E+15
Cs-134	8.822E+00	1.240E+01	2.448E+01	2.656E+02	2.469E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.033E+01	2.090E+01	2.209E+01	2.688E+01	4.817E+01	1.422E+08	*8.593E+13	*8.593E+13
Ni-63	2.008E+04	2.082E+04	2.238E+04	2.896E+04	6.277E+04	8.129E+09	*5.586E+13	1.448E+09
Sr-90	3.709E+01	6.361E+01	1.880E+02	8.373E+03	4.464E+08	8.044E+11	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.987E+00	5.013E+00	4.987E+00	5.013E+00
Cs-134	1.000E+00	0.000E+00	2.834E+00	8.822E+00	2.834E+00	8.822E+00
Cs-137	1.000E+00	0.000E+00	1.230E+00	2.033E+01	1.230E+00	2.033E+01
Ni-63	1.000E+00	0.000E+00	1.245E-03	2.008E+04	1.245E-03	2.008E+04
Sr-90	1.000E+00	0.000E+00	6.740E-01	3.709E+01	6.740E-01	3.709E+01

RESRAD, Version 7.0 T½ Limit = 30 days 12/05/2014 17:45 Page 18
Summary : ZION Surface Soil 10,000 m^2 120514
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 10,000.0 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.136E+00	4.486E+00	3.421E+00	1.323E+00	8.528E-02	5.155E-12	0.000E+00	0.000E+00
Cs-134	Cs-134	1.000E+00	3.036E+00	2.160E+00	1.093E+00	1.007E-01	1.081E-04	2.072E-20	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.371E+00	1.333E+00	1.260E+00	1.033E+00	5.716E-01	5.455E-07	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	3.132E-03	3.022E-03	2.810E-03	2.172E-03	1.002E-03	9.762E-09	0.000E+00	3.283E-08
Sr-90+D	Sr-90+D	1.000E+00	8.750E-01	5.106E-01	1.728E-01	3.879E-03	7.272E-08	2.924E-07	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.868E+00	5.573E+00	7.307E+00	1.890E+01	2.932E+02	4.849E+12	*1.113E+15	*1.113E+15
Cs-134	8.235E+00	1.157E+01	2.286E+01	2.482E+02	2.314E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.824E+01	1.876E+01	1.984E+01	2.421E+01	4.374E+01	4.583E+07	*8.593E+13	*8.593E+13
Ni-63	7.981E+03	8.273E+03	8.896E+03	1.151E+04	2.495E+04	2.561E+09	*5.586E+13	7.616E+08
Sr-90	2.857E+01	4.896E+01	1.447E+02	6.446E+03	3.438E+08	8.550E+07	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.136E+00	4.868E+00	5.136E+00	4.868E+00
Cs-134	1.000E+00	0.000E+00	3.036E+00	8.235E+00	3.036E+00	8.235E+00
Cs-137	1.000E+00	0.000E+00	1.371E+00	1.824E+01	1.371E+00	1.824E+01
Ni-63	1.000E+00	0.000E+00	3.132E-03	7.981E+03	3.132E-03	7.981E+03
Sr-90	1.000E+00	0.000E+00	8.750E-01	2.857E+01	8.750E-01	2.857E+01

ATTACHMENT 3

RESRAD Run to Determine Subsurface Soil Area Factors for 64,500 m^2 Contamination Area

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:49 Page 1
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 2
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: Subsurface Soil DCGL 120614 Plus FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(2)
A-1	Cs-134 (Source: FGR 12)	9.472E+00	9.472E+00	DCF1(3)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(4)
A-1	Ni-63 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(5)
A-1	Sr-90 (Source: FGR 12)	7.043E-04	7.043E-04	DCF1(6)
A-1	Y-90 (Source: FGR 12)	2.391E-02	2.391E-02	DCF1(7)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Co-60	2.190E-04	2.190E-04	DCF2(1)
B-1	Cs-134	4.620E-05	4.620E-05	DCF2(2)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(3)
B-1	Ni-63	6.290E-06	6.290E-06	DCF2(4)
B-1	Sr-90+D	1.308E-03	1.300E-03	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-134	7.330E-05	7.330E-05	DCF3(2)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(3)
D-1	Ni-63	5.770E-07	5.770E-07	DCF3(4)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(5)
D-34	Food transfer factors:			
D-34	Co-60 , plant/soil concentration ratio, dimensionless	1.500E-01	8.000E-02	RTF(1,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.800E-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				
D-34	Cs-134 , plant/soil concentration ratio, dimensionless	7.800E-02	4.000E-02	RTF(2,1)
D-34	Cs-134 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	6.500E-02	3.000E-02	RTF(2,2)
D-34	Cs-134 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.400E-02	8.000E-03	RTF(2,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	7.800E-02	4.000E-02	RTF(3,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	6.500E-02	3.000E-02	RTF(3,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.400E-02	8.000E-03	RTF(3,3)
D-34				
D-34	Ni-63 , plant/soil concentration ratio, dimensionless	9.200E-02	5.000E-02	RTF(4,1)
D-34	Ni-63 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Ni-63 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.200E-02	2.000E-02	RTF(4,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	5.900E-01	3.000E-01	RTF(5,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(5,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.700E-03	2.000E-03	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				
D-5	Cs-134 , fish	2.000E+03	2.000E+03	BIOFAC(2,1)
D-5	Cs-134 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 3
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: Subsurface Soil DCGL 120614 Plus FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(3,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Ni-63 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Ni-63 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(5,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(5,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

RESRAD, Version 7.0   T½ Limit = 30 days   12/06/2014 16:49 Page 4
Summary : Zion Subsurface Soil 64,500 m2 (CF is =1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DOSE.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)	6.450E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	2.870E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01		T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01		T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02		T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03		T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Cs-134	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ni-63	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(5)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00		W1(1)
R012	Concentration in groundwater (pCi/L): Cs-134	not used	0.000E+00		W1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ni-63	not used	0.000E+00		W1(4)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00		W1(5)
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)	1.800E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	6.600E-02	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.700E-01	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.200E+00	2.000E+00		WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00		HUMID
R013	Evapotranspiration coefficient	6.250E-01	5.000E-01		EVAPTR
R013	Precipitation (m/yr)	8.300E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.900E-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)	1.800E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	6.600E-02	2.000E-01		FCSZ

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 5
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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 conductivity (m/yr)	2.880E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	3.900E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.300E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.250E+03	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	2.600E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.800E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.500E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.900E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	6.600E-02	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	9.700E-01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.880E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.161E+03	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.532E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Cs-134				
R016	Contaminated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.893E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.150E+02	4.600E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.893E-04	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)	6.200E+01	1.000E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.200E+01	1.000E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.200E+01	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.868E-03	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	2.300E+00	3.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.614E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 6
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.350E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	5.500E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.490E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.240E-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)	1.120E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	2.140E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	2.330E+02	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.510E+01	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)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.780E+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	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 7
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	2.630E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	6.520E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.060E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	6.000E+01	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)	4.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	2.300E-01	1.500E-01	---	DM
R019	Depth of roots (m)	1.220E+00	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)	1.750E+00	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	2.900E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.900E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	2.460E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	1.230E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.200E-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	3.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	3.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	3.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	3.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	5.800E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	3.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	3.300E+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
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	1.000E+00	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)

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 8
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	512	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	17	---	---	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	suppressed
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

```
RESRAD, Version 7.0      T% Limit = 30 days          12/06/2014  16:49  Page   9
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

     Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g
     ____________________________            _________________________________

       Area:  64500.00 square meters               Co-60      1.000E+00
  Thickness:      1.00 meters                      Cs-134     1.000E+00
Cover Depth:      0.00 meters                      Cs-137     1.000E+00
                                                   Ni-63      1.000E+00
                                                   Sr-90      1.000E+00


                              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):  2.260E+01  1.954E+01  1.499E+01  7.168E+00  2.890E+00  3.366E-01  2.806E-03  2.061E-06
      M(t):  9.040E-01  7.816E-01  5.998E-01  2.867E-01  1.156E-01  1.347E-02  1.123E-04  8.246E-08

Maximum TDOSE(t):  2.260E+01 mrem/yr   at t = 0.000E+00 years
```

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:49 Page 10
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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	5.644E+00	0.2497	1.972E-06	0.0000	0.000E+00	0.0000	2.066E-01	0.0091	3.786E-01	0.0168	9.998E-02	0.0044	3.565E-04	0.0000
Cs-134	2.983E+00	0.1320	3.771E-07	0.0000	0.000E+00	0.0000	2.653E-01	0.0117	6.082E-01	0.0269	9.478E-01	0.0419	8.807E-04	0.0000
Cs-137	1.248E+00	0.0552	3.030E-07	0.0000	0.000E+00	0.0000	2.106E-01	0.0093	4.828E-01	0.0214	7.524E-01	0.0333	6.991E-04	0.0000
Ni-63	0.000E+00	0.0000	6.016E-08	0.0000	0.000E+00	0.0000	2.886E-03	0.0001	4.922E-04	0.0000	2.319E-02	0.0010	8.122E-06	0.0000
Sr-90	8.701E-03	0.0004	1.197E-05	0.0000	0.000E+00	0.0000	4.697E+00	0.2078	1.083E+00	0.0479	2.954E+00	0.1307	2.057E-03	0.0001
Total	9.883E+00	0.4373	1.468E-05	0.0000	0.000E+00	0.0000	5.383E+00	0.2382	2.553E+00	0.1130	4.777E+00	0.2114	4.001E-03	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	6.329E+00	0.2801
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.805E+00	0.2126
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	2.694E+00	0.1192
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	2.657E-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	8.744E+00	0.3869
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	2.260E+01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 11
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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-	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	4.947E+00	0.2532	1.729E-06	0.0000	0.000E+00	0.0000	1.806E-01	0.0093	3.314E-01	0.0170	8.753E-02	0.0045	3.126E-04	0.0000
Cs-134	2.132E+00	0.1091	2.695E-07	0.0000	0.000E+00	0.0000	1.893E-01	0.0097	4.341E-01	0.0222	6.764E-01	0.0346	6.294E-04	0.0000
Cs-137	1.219E+00	0.0624	2.961E-07	0.0000	0.000E+00	0.0000	2.055E-01	0.0105	4.711E-01	0.0241	7.341E-01	0.0376	6.831E-04	0.0000
Ni-63	0.000E+00	0.0000	5.957E-08	0.0000	0.000E+00	0.0000	2.854E-03	0.0001	4.869E-04	0.0000	2.293E-02	0.0012	8.043E-06	0.0000
Sr-90	7.872E-03	0.0004	1.082E-05	0.0000	0.000E+00	0.0000	4.244E+00	0.2172	9.789E-01	0.0501	2.670E+00	0.1367	1.861E-03	0.0001
Total	8.306E+00	0.4251	1.318E-05	0.0000	0.000E+00	0.0000	4.822E+00	0.2468	2.216E+00	0.1134	4.191E+00	0.2145	3.494E-03	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-	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	5.548E+00	0.2839
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.432E+00	0.1757
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	2.631E+00	0.1346
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	2.628E-02	0.0013
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	7.903E+00	0.4044
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	1.954E+01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 12
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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	3.802E+00	0.2536	1.329E-06	0.0000	0.000E+00	0.0000	1.385E-01	0.0092	2.540E-01	0.0169	6.708E-02	0.0045	2.402E-04	0.0000
Cs-134	1.089E+00	0.0726	1.376E-07	0.0000	0.000E+00	0.0000	9.640E-02	0.0064	2.212E-01	0.0148	3.445E-01	0.0230	3.214E-04	0.0000
Cs-137	1.164E+00	0.0776	2.826E-07	0.0000	0.000E+00	0.0000	1.955E-01	0.0130	4.487E-01	0.0299	6.988E-01	0.0466	6.520E-04	0.0000
Ni-63	0.000E+00	0.0000	5.841E-08	0.0000	0.000E+00	0.0000	2.790E-03	0.0002	4.763E-04	0.0000	2.242E-02	0.0015	7.887E-06	0.0000
Sr-90	6.442E-03	0.0004	8.858E-06	0.0000	0.000E+00	0.0000	3.463E+00	0.2309	7.988E-01	0.0533	2.179E+00	0.1453	1.523E-03	0.0001
Total	6.061E+00	0.4042	1.067E-05	0.0000	0.000E+00	0.0000	3.896E+00	0.2598	1.723E+00	0.1149	3.312E+00	0.2209	2.744E-03	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	4.262E+00	0.2842
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.751E+00	0.1168
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	2.507E+00	0.1672
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	2.570E-02	0.0017
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	6.448E+00	0.4300
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	1.499E+01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 13
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.513E+00	0.2111	5.287E-07	0.0000	0.000E+00	0.0000	5.454E-02	0.0076	1.002E-01	0.0140	2.642E-02	0.0037	9.558E-05	0.0000
Cs-134	1.036E-01	0.0145	1.310E-08	0.0000	0.000E+00	0.0000	9.079E-03	0.0013	2.088E-02	0.0029	3.248E-02	0.0045	3.059E-05	0.0000
Cs-137	9.869E-01	0.1380	2.401E-07	0.0000	0.000E+00	0.0000	1.644E-01	0.0229	3.781E-01	0.0527	5.882E-01	0.0821	5.540E-04	0.0001
Ni-63	0.000E+00	0.0000	5.454E-08	0.0000	0.000E+00	0.0000	2.578E-03	0.0004	4.409E-04	0.0001	2.074E-02	0.0029	7.365E-06	0.0000
Sr-90	3.194E-03	0.0004	4.392E-06	0.0000	0.000E+00	0.0000	1.699E+00	0.2370	3.920E-01	0.0547	1.069E+00	0.1491	7.550E-04	0.0001
Total	2.609E+00	0.3639	5.229E-06	0.0000	0.000E+00	0.0000	1.929E+00	0.2692	8.916E-01	0.1244	1.737E+00	0.2423	1.443E-03	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+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.
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	1.694E+00	0.2364
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.661E-01	0.0232
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	2.120E+00	0.2958
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	2.376E-02	0.0033
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	3.164E+00	0.4414
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	7.168E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 14
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

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	1.087E-01	0.0376	3.799E-08	0.0000	0.000E+00	0.0000	3.800E-03	0.0013	7.006E-03	0.0024	1.845E-03	0.0006	6.869E-06	0.0000
Cs-134	1.251E-04	0.0000	1.581E-11	0.0000	0.000E+00	0.0000	1.062E-05	0.0000	2.460E-05	0.0000	3.814E-05	0.0000	3.692E-08	0.0000
Cs-137	6.210E-01	0.2148	1.508E-07	0.0000	0.000E+00	0.0000	1.001E-01	0.0346	2.318E-01	0.0802	3.593E-01	0.1243	3.479E-04	0.0001
Ni-63	0.000E+00	0.0000	4.484E-08	0.0000	0.000E+00	0.0000	2.055E-03	0.0007	3.536E-04	0.0001	1.658E-02	0.0057	6.055E-06	0.0000
Sr-90	4.304E-04	0.0001	5.918E-07	0.0000	0.000E+00	0.0000	2.219E-01	0.0768	5.127E-02	0.0177	1.397E-01	0.0483	1.017E-04	0.0000
Total	7.302E-01	0.2527	8.255E-07	0.0000	0.000E+00	0.0000	3.279E-01	0.1134	2.904E-01	0.1005	5.175E-01	0.1791	4.626E-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+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.
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	1.214E-01	0.0420
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.985E-04	0.0001
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	1.312E+00	0.4541
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	1.899E-02	0.0066
Sr-90	7.908E-01	0.2736	0.000E+00	0.0000	0.000E+00	0.0000	3.815E-02	0.0132	6.702E-02	0.0232	1.277E-01	0.0442	1.437E+00	0.4973
Total	7.908E-01	0.2736	0.000E+00	0.0000	0.000E+00	0.0000	3.815E-02	0.0132	6.702E-02	0.0232	1.277E-01	0.0442	2.890E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 15
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Co-60	1.082E-05	0.0000	3.780E-12	0.0000	0.000E+00	0.0000	3.365E-07	0.0000	6.305E-07	0.0000	1.646E-07	0.0000	6.835E-10	0.0000
Cs-134	7.638E-15	0.0000	9.656E-22	0.0000	0.000E+00	0.0000	5.774E-16	0.0000	1.374E-15	0.0000	2.102E-15	0.0000	2.255E-18	0.0000
Cs-137	1.218E-01	0.3619	2.958E-08	0.0000	0.000E+00	0.0000	1.748E-02	0.0519	4.159E-02	0.1236	6.361E-02	0.1890	6.825E-05	0.0002
Ni-63	0.000E+00	0.0000	2.259E-08	0.0000	0.000E+00	0.0000	9.214E-04	0.0027	1.624E-04	0.0005	7.523E-03	0.0223	3.051E-06	0.0000
Sr-90	3.866E-07	0.0000	5.316E-10	0.0000	0.000E+00	0.0000	1.774E-04	0.0005	4.117E-05	0.0001	1.119E-04	0.0003	9.137E-08	0.0000
Total	1.218E-01	0.3619	5.271E-08	0.0000	0.000E+00	0.0000	1.857E-02	0.0552	4.180E-02	0.1242	7.124E-02	0.2116	7.140E-05	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+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.
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	1.195E-05	0.0000
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.169E-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	2.446E-01	0.7265
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	8.610E-03	0.0256
Sr-90	6.380E-02	0.1895	0.000E+00	0.0000	0.000E+00	0.0000	3.108E-03	0.0092	5.537E-03	0.0164	1.066E-02	0.0317	8.343E-02	0.2478
Total	6.380E-02	0.1895	0.000E+00	0.0000	0.000E+00	0.0000	3.108E-03	0.0092	5.537E-03	0.0164	1.066E-02	0.0317	3.366E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 16
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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-	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	3.974E-17	0.0000	1.389E-23	0.0000	0.000E+00	0.0000	7.998E-19	0.0000	1.617E-18	0.0000	4.058E-19	0.0000	2.512E-21	0.0000
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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	1.161E-03	0.4137	2.820E-10	0.0000	0.000E+00	0.0000	1.077E-04	0.0384	2.908E-04	0.1036	4.186E-04	0.1492	6.505E-07	0.0002
Ni-63	0.000E+00	0.0000	3.187E-09	0.0000	0.000E+00	0.0000	8.407E-05	0.0300	1.657E-05	0.0059	7.265E-04	0.2589	4.304E-07	0.0002
Sr-90	7.629E-16	0.0000	1.049E-18	0.0000	0.000E+00	0.0000	2.264E-13	0.0000	5.372E-14	0.0000	1.443E-13	0.0000	1.803E-16	0.0000
Total	1.161E-03	0.4137	3.469E-09	0.0000	0.000E+00	0.0000	1.918E-04	0.0683	3.073E-04	0.1095	1.145E-03	0.4081	1.081E-06	0.0004

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.
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	4.256E-17	0.0000
Cs-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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	1.979E-03	0.7051
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	8.276E-04	0.2949
Sr-90	8.541E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.161E-12	0.0000	7.413E-12	0.0000	1.427E-11	0.0000	1.117E-10	0.0000
Total	8.541E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.161E-12	0.0000	7.413E-12	0.0000	1.427E-11	0.0000	2.806E-03	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 17
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

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-134	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	6.780E-07	0.3289	0.000E+00	0.0000	0.000E+00	0.0000	2.737E-08	0.0133	3.635E-08	0.0176	1.320E-06	0.6402	2.061E-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	0.000E+00	0.0000
Total	6.780E-07	0.3289	0.000E+00	0.0000	0.000E+00	0.0000	2.737E-08	0.0133	3.635E-08	0.0176	1.320E-06	0.6402	2.061E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:49 Page 18
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	6.329E+00	5.546E+00	4.262E+00	1.694E+00	1.214E-01	1.195E-05	4.256E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	4.805E+00	3.432E+00	1.751E+00	1.661E-01	1.985E-04	1.169E-14	5.045E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	2.694E+00	2.631E+00	2.507E+00	2.120E+00	1.312E+00	2.446E-01	1.979E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	2.657E-02	2.628E-02	2.570E-02	2.376E-02	1.899E-02	8.610E-03	8.276E-04	2.061E-06
Sr-90+D	Sr-90+D	1.000E+00	8.744E+00	7.903E+00	6.448E+00	3.164E+00	1.437E+00	8.343E-02	1.117E-10	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	3.950E+00	4.506E+00	5.866E+00	1.476E+01	2.060E+02	2.092E+06	*1.113E+15	*1.113E+15
Cs-134	5.203E+00	7.284E+00	1.428E+01	1.505E+02	1.260E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	9.279E+00	9.504E+00	9.970E+00	1.179E+01	1.905E+01	1.022E+02	1.263E+04	*8.593E+13
Ni-63	9.408E+02	9.513E+02	9.728E+02	1.052E+03	1.316E+03	2.904E+03	3.021E+04	1.213E+07
Sr-90	2.859E+00	3.163E+00	3.877E+00	7.902E+00	1.740E+01	2.997E+02	2.239E+11	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	6.329E+00	3.950E+00	6.329E+00	3.950E+00
Cs-134	1.000E+00	0.000E+00	4.805E+00	5.203E+00	4.805E+00	5.203E+00
Cs-137	1.000E+00	0.000E+00	2.694E+00	9.279E+00	2.694E+00	9.279E+00
Ni-63	1.000E+00	0.000E+00	2.657E-02	9.408E+02	2.657E-02	9.408E+02
Sr-90	1.000E+00	0.000E+00	8.744E+00	2.859E+00	8.744E+00	2.859E+00

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:49 Page 19
Summary : Zion Subsurface Soil 64,500 m^2 (CF is -1) 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	6.329E+00	5.548E+00	4.262E+00	1.694E+00	1.214E-01	1.195E-05	4.256E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	4.805E+00	3.432E+00	1.751E+00	1.661E-01	1.985E-04	1.169E-14	0.000E+00	0.000E+00
Cs-137	Cs-137	1.000E+00	2.694E+00	2.631E+00	2.507E+00	2.120E+00	1.312E+00	2.446E-01	1.979E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	2.657E-02	2.628E-02	2.570E-02	2.376E-02	1.899E-02	8.610E-03	8.276E-04	2.061E-06
Sr-90	Sr-90	1.000E+00	8.744E+00	7.903E+00	6.448E+00	3.164E+00	1.437E+00	8.343E-02	1.117E-10	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.000E+00	8.766E-01	6.737E-01	2.681E-01	1.927E-02	1.917E-06	7.044E-18	0.000E+00
Cs-134	Cs-134	1.000E+00	1.000E+00	7.146E-01	3.650E-01	3.474E-02	4.193E-05	2.560E-15	1.682E-44	0.000E+00
Cs-137	Cs-137	1.000E+00	1.000E+00	9.770E-01	9.326E-01	7.924E-01	4.976E-01	9.763E-02	9.304E-04	7.864E-11
Ni-63	Ni-63	1.000E+00	1.000E+00	9.903E-01	9.710E-01	9.067E-01	7.454E-01	3.756E-01	5.299E-02	5.587E-05
Sr-90	Sr-90	1.000E+00	1.000E+00	9.046E-01	7.403E-01	3.671E-01	4.946E-02	4.442E-05	8.767E-14	2.943E-44

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

RESCALC.EXE execution time = 1.72 seconds

ATTACHMENT 4

Summary of RESRAD Runs Used to Determine Area Factors for Remaining Subsurface Soil Contamination Areas

RESRAD Run Page 18 for 0.01 m^2 Contamination Area

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:25 Page 18
Summary : Zion Subsurface Soil 0.01 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.778E-03	5.066E-03	3.893E-03	1.549E-03	1.113E-04	1.108E-08	4.068E-20	0.000E+00
Cs-134	Cs-134	1.000E+00	3.154E-03	2.254E-03	1.151E-03	1.096E-04	1.322E-07	8.073E-18	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.321E-03	1.290E-03	1.232E-03	1.046E-03	6.571E-04	1.289E-04	1.228E-06	0.000E+00
Ni-63	Ni-63	1.000E+00	5.146E-08	5.090E-08	4.980E-08	4.612E-08	3.703E-08	1.710E-08	1.782E-09	1.903E-12
Sr-90+D	Sr-90+D	1.000E+00	6.024E-05	5.444E-05	4.444E-05	2.185E-05	2.094E-08	1.687E-08	2.236E-17	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.327E+03	4.935E+03	6.422E+03	1.614E+04	2.246E+05	2.257E+09	*1.113E+15	*1.113E+15
Cs-134	7.928E+03	1.109E+04	2.172E+04	2.282E+05	1.891E+08	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.893E+04	1.938E+04	2.030E+04	2.389E+04	3.805E+04	1.940E+05	2.037E+07	*8.593E+13
Ni-63	4.858E+08	4.911E+08	5.020E+08	5.420E+08	6.751E+08	1.462E+09	1.403E+10	1.313E+13
Sr-90	4.150E+05	4.592E+05	5.625E+05	1.144E+06	1.194E+06	1.482E+09	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.778E-03	4.327E+03	5.778E-03	4.327E+03
Cs-134	1.000E+00	0.000E+00	3.154E-03	7.928E+03	3.154E-03	7.928E+03
Cs-137	1.000E+00	0.000E+00	1.321E-03	1.893E+04	1.321E-03	1.893E+04
Ni-63	1.000E+00	0.000E+00	5.146E-08	4.858E+08	5.146E-08	4.858E+08
Sr-90	1.000E+00	0.000E+00	6.024E-05	4.150E+05	6.024E-05	4.150E+05

RESRAD Run Page 18 for 0.03 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/06/2014  16:24  Page  18
Summary : Zion Subsurface Soil 0.03 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.733E-02	1.520E-02	1.168E-02	4.647E-03	3.339E-04	3.323E-08	1.220E-19	0.000E+00
Cs-134	Cs-134	1.000E+00	9.461E-03	6.761E-03	3.453E-03	3.287E-04	3.966E-07	2.422E-17	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	3.962E-03	3.871E-03	3.695E-03	3.139E-03	1.971E-03	3.867E-04	3.683E-06	0.000E+00
Ni-63	Ni-63	1.000E+00	1.345E-07	1.330E-07	1.300E-07	1.203E-07	9.624E-08	4.380E-08	4.291E-09	5.721E-12
Sr-90+D	Sr-90+D	1.000E+00	1.768E-04	1.597E-04	1.304E-04	6.409E-05	6.262E-05	5.043E-08	6.674E-17	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.442E+03	1.645E+03	2.141E+03	5.380E+03	7.486E+04	7.524E+08	*1.113E+15	*1.113E+15
Cs-134	2.643E+03	3.698E+03	7.241E+03	7.607E+04	6.303E+07	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	6.310E+03	6.459E+03	6.766E+03	7.963E+03	1.268E+04	6.466E+04	6.789E+06	*8.593E+13
Ni-63	1.859E+08	1.880E+08	1.922E+08	2.078E+08	2.598E+08	5.707E+08	5.827E+09	4.370E+12
Sr-90	1.414E+05	1.565E+05	1.917E+05	3.901E+05	3.992E+05	4.958E+08	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.733E-02	1.442E+03	1.733E-02	1.442E+03
Cs-134	1.000E+00	0.000E+00	9.461E-03	2.643E+03	9.461E-03	2.643E+03
Cs-137	1.000E+00	0.000E+00	3.962E-03	6.310E+03	3.962E-03	6.310E+03
Ni-63	1.000E+00	0.000E+00	1.345E-07	1.859E+08	1.345E-07	1.859E+08
Sr-90	1.000E+00	0.000E+00	1.768E-04	1.414E+05	1.768E-04	1.414E+05

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:23 Page 18
Summary : Zion Subsurface Soil 0.1 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 0.1 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.778E-02	5.065E-02	3.893E-02	1.549E-02	1.113E-03	1.108E-07	4.068E-19	0.000E+00
Cs-134	Cs-134	1.000E+00	3.153E-02	2.254E-02	1.151E-02	1.096E-03	1.322E-06	8.073E-17	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.321E-02	1.290E-02	1.232E-02	1.046E-02	6.571E-03	1.289E-03	1.228E-05	0.000E+00
Ni-63	Ni-63	1.000E+00	4.217E-07	4.170E-07	4.078E-07	3.770E-07	3.011E-07	1.361E-07	1.290E-08	1.914E-11
Sr-90+D	Sr-90+D	1.000E+00	5.839E-04	5.277E-04	4.308E-04	2.117E-04	2.086E-04	1.680E-07	2.222E-16	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.327E+02	4.936E+02	6.422E+02	1.614E+03	2.246E+04	2.257E+08	*1.113E+15	*1.113E+15
Cs-134	7.928E+02	1.109E+03	2.172E+03	2.282E+04	1.891E+07	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.893E+03	1.938E+03	2.030E+03	2.389E+03	3.805E+03	1.940E+04	2.037E+06	*8.593E+13
Ni-63	5.928E+07	5.995E+07	6.131E+07	6.632E+07	8.304E+07	1.837E+08	1.938E+09	1.306E+12
Sr-90	4.281E+04	4.738E+04	5.804E+04	1.181E+05	1.198E+05	1.488E+08	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.778E-02	4.327E+02	5.778E-02	4.327E+02
Cs-134	1.000E+00	0.000E+00	3.153E-02	7.928E+02	3.153E-02	7.928E+02
Cs-137	1.000E+00	0.000E+00	1.321E-02	1.893E+03	1.321E-02	1.893E+03
Ni-63	1.000E+00	0.000E+00	4.217E-07	5.928E+07	4.217E-07	5.928E+07
Sr-90	1.000E+00	0.000E+00	5.839E-04	4.281E+04	5.839E-04	4.281E+04

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:21 Page 18
Summary : Zion Subsurface Soil 0.3 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 0.3 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.733E-01	1.520E-01	1.168E-01	4.647E-02	3.339E-03	3.323E-07	1.220E-18	0.000E+00
Cs-134	Cs-134	1.000E+00	9.460E-02	6.761E-02	3.453E-02	3.287E-03	3.966E-06	2.422E-16	1.401E-45	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	3.962E-02	3.871E-02	3.695E-02	3.139E-02	1.971E-02	3.867E-03	3.683E-05	0.000E+00
Ni-63	Ni-63	1.000E+00	1.239E-06	1.225E-06	1.198E-06	1.107E-06	8.839E-07	3.985E-07	3.733E-08	5.774E-11
Sr-90+D	Sr-90+D	1.000E+00	1.747E-03	1.578E-03	1.288E-03	6.332E-04	6.274E-04	5.051E-07	6.680E-16	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.442E+02	1.645E+02	2.141E+02	5.380E+02	7.486E+03	7.524E+07	*1.113E+15	*1.113E+15
Cs-134	2.643E+02	3.698E+02	7.241E+02	7.607E+03	6.303E+06	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	6.310E+02	6.459E+02	6.767E+02	7.964E+02	1.268E+03	6.466E+03	6.789E+05	*8.593E+13
Ni-63	2.017E+07	2.040E+07	2.087E+07	2.257E+07	2.828E+07	6.274E+07	6.698E+08	4.330E+11
Sr-90	1.431E+04	1.584E+04	1.940E+04	3.948E+04	3.985E+04	4.949E+07	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.733E-01	1.442E+02	1.733E-01	1.442E+02
Cs-134	1.000E+00	0.000E+00	9.460E-02	2.643E+02	9.460E-02	2.643E+02
Cs-137	1.000E+00	0.000E+00	3.962E-02	6.310E+02	3.962E-02	6.310E+02
Ni-63	1.000E+00	0.000E+00	1.239E-06	2.017E+07	1.239E-06	2.017E+07
Sr-90	1.000E+00	0.000E+00	1.747E-03	1.431E+04	1.747E-03	1.431E+04

RESRAD Run Page 18 for 1 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days        12/06/2014  16:19  Page  18
Summary : Zion Subsurface Soil 1.0 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.777E-01	5.065E-01	3.892E-01	1.549E-01	1.113E-02	1.107E-06	4.067E-18	0.000E+00
Cs-134	Cs-134	1.000E+00	3.153E-01	2.253E-01	1.151E-01	1.095E-02	1.322E-05	8.072E-16	5.605E-45	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.320E-01	1.290E-01	1.231E-01	1.046E-01	6.570E-02	1.289E-02	1.227E-04	0.000E+00
Ni-63	Ni-63	1.000E+00	4.096E-06	4.051E-06	3.960E-06	3.660E-06	2.921E-06	1.315E-06	1.226E-07	1.945E-10
Sr-90+D	Sr-90+D	1.000E+00	5.815E-03	5.255E-03	4.290E-03	2.108E-03	2.102E-03	1.693E-06	2.238E-15	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.327E+01	4.936E+01	6.423E+01	1.614E+02	2.246E+03	2.258E+07	*1.113E+15	*1.113E+15
Cs-134	7.929E+01	1.109E+02	2.172E+02	2.282E+03	1.891E+06	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.893E+02	1.938E+02	2.030E+02	2.389E+02	3.805E+02	1.940E+03	2.037E+05	*8.593E+13
Ni-63	6.103E+06	6.172E+06	6.312E+06	6.830E+06	8.560E+06	1.901E+07	2.039E+08	1.285E+11
Sr-90	4.299E+03	4.757E+03	5.828E+03	1.186E+04	1.189E+04	1.477E+07	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.777E-01	4.327E+01	5.777E-01	4.327E+01
Cs-134	1.000E+00	0.000E+00	3.153E-01	7.929E+01	3.153E-01	7.929E+01
Cs-137	1.000E+00	0.000E+00	1.320E-01	1.893E+02	1.320E-01	1.893E+02
Ni-63	1.000E+00	0.000E+00	4.096E-06	6.103E+06	4.096E-06	6.103E+06
Sr-90	1.000E+00	0.000E+00	5.815E-03	4.299E+03	5.815E-03	4.299E+03

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:18 Page 18
Summary : Zion Subsurface Soil 3.0 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 3 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	1.289E+00	1.130E+00	8.682E-01	3.455E-01	2.483E-02	2.470E-06	9.072E-18	0.000E+00
Cs-134	Cs-134	1.000E+00	6.942E-01	4.961E-01	2.534E-01	2.412E-02	2.910E-05	1.777E-15	1.121E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	2.908E-01	2.841E-01	2.712E-01	2.304E-01	1.447E-01	2.838E-02	2.702E-04	0.000E+00
Ni-63	Ni-63	1.000E+00	1.226E-05	1.212E-05	1.185E-05	1.095E-05	8.737E-06	3.934E-06	3.660E-07	5.953E-10
Sr-90+D	Sr-90+D	1.000E+00	1.672E-02	1.511E-02	1.233E-02	6.057E-03	6.336E-03	5.098E-06	6.719E-15	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	1.940E+01	2.213E+01	2.879E+01	7.237E+01	1.007E+03	1.012E+07	*1.113E+15	*1.113E+15
Cs-134	3.601E+01	5.039E+01	9.868E+01	1.037E+03	8.590E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	8.597E+01	8.799E+01	9.218E+01	1.085E+02	1.728E+02	8.809E+02	9.251E+04	*8.593E+13
Ni-63	2.040E+06	2.063E+06	2.110E+06	2.283E+06	2.861E+06	6.356E+06	6.830E+07	4.200E+10
Sr-90	1.495E+03	1.655E+03	2.027E+03	4.127E+03	3.946E+03	4.904E+06	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	1.289E+00	1.940E+01	1.289E+00	1.940E+01
Cs-134	1.000E+00	0.000E+00	6.942E-01	3.601E+01	6.942E-01	3.601E+01
Cs-137	1.000E+00	0.000E+00	2.908E-01	8.597E+01	2.908E-01	8.597E+01
Ni-63	1.000E+00	0.000E+00	1.226E-05	2.040E+06	1.226E-05	2.040E+06
Sr-90	1.000E+00	0.000E+00	1.672E-02	1.495E+03	1.672E-02	1.495E+03

RESRAD Run Page 18 for 10 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days        12/06/2014  16:17  Page  18
Summary : Zion Subsurface Soil 10 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	2.678E+00	2.348E+00	1.804E+00	7.180E-01	5.160E-02	5.134E-06	1.885E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	1.435E+00	1.026E+00	5.239E-01	4.987E-02	6.018E-05	3.674E-15	2.382E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	6.018E-01	5.880E-01	5.612E-01	4.769E-01	2.994E-01	5.871E-02	5.588E-04	0.000E+00
Ni-63	Ni-63	1.000E+00	4.081E-05	4.035E-05	3.945E-05	3.646E-05	2.909E-05	1.310E-05	1.218E-06	2.177E-09
Sr-90+D	Sr-90+D	1.000E+00	5.318E-02	4.805E-02	3.921E-02	1.925E-02	2.139E-02	1.773E-05	2.330E-14	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	9.334E+00	1.065E+01	1.385E+01	3.482E+01	4.845E+02	4.870E+06	*1.113E+15	*1.113E+15
Cs-134	1.742E+01	2.437E+01	4.772E+01	5.013E+02	4.154E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	4.154E+01	4.252E+01	4.454E+01	5.243E+01	8.350E+01	4.258E+02	4.474E+04	*8.593E+13
Ni-63	6.127E+05	6.196E+05	6.337E+05	6.857E+05	8.594E+05	1.909E+06	2.053E+07	1.148E+10
Sr-90	4.701E+02	5.203E+02	6.375E+02	1.298E+03	1.169E+03	1.410E+06	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	2.678E+00	9.334E+00	2.678E+00	9.334E+00
Cs-134	1.000E+00	0.000E+00	1.435E+00	1.742E+01	1.435E+00	1.742E+01
Cs-137	1.000E+00	0.000E+00	6.018E-01	4.154E+01	6.018E-01	4.154E+01
Ni-63	1.000E+00	0.000E+00	4.081E-05	6.127E+05	4.081E-05	6.127E+05
Sr-90	1.000E+00	0.000E+00	5.318E-02	4.701E+02	5.318E-02	4.701E+02

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:16 Page 18
Summary : Zion Subsurface Soil 30 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 30 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	3.721E+00	3.262E+00	2.507E+00	9.975E-01	7.166E-02	7.131E-06	2.618E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	1.983E+00	1.417E+00	7.238E-01	6.889E-02	8.313E-05	5.074E-15	3.363E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	8.336E-01	8.144E-01	7.773E-01	6.604E-01	4.146E-01	8.126E-02	7.722E-04	0.000E+00
Ni-63	Ni-63	1.000E+00	1.224E-04	1.210E-04	1.183E-04	1.093E-04	8.724E-05	3.927E-05	3.651E-06	6.549E-09
Sr-90+D	Sr-90+D	1.000E+00	1.528E-01	1.381E-01	1.127E-01	5.529E-02	6.389E-02	5.294E-05	6.938E-14	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	6.719E+00	7.664E+00	9.973E+00	2.506E+01	3.488E+02	3.506E+06	*1.113E+15	*1.113E+15
Cs-134	1.261E+01	1.764E+01	3.454E+01	3.629E+02	3.007E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.999E+01	3.070E+01	3.216E+01	3.785E+01	6.030E+01	3.077E+02	3.237E+04	*8.593E+13
Ni-63	2.043E+05	2.066E+05	2.113E+05	2.286E+05	2.866E+05	6.366E+05	6.848E+06	3.817E+09
Sr-90	1.636E+02	1.811E+02	2.219E+02	4.522E+02	3.913E+02	4.722E+05	*1.366E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	3.721E+00	6.719E+00	3.721E+00	6.719E+00
Cs-134	1.000E+00	0.000E+00	1.983E+00	1.261E+01	1.983E+00	1.261E+01
Cs-137	1.000E+00	0.000E+00	8.336E-01	2.999E+01	8.336E-01	2.999E+01
Ni-63	1.000E+00	0.000E+00	1.224E-04	2.043E+05	1.224E-04	2.043E+05
Sr-90	1.000E+00	0.000E+00	1.528E-01	1.636E+02	1.528E-01	1.636E+02

RESRAD, Version 7.0 T½ Limit = 30 days 12/06/2014 16:15 Page 18
Summary : Zion Subsurface Soil 100 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 100 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	4.617E+00	4.047E+00	3.110E+00	1.238E+00	8.893E-02	8.844E-06	3.244E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	2.460E+00	1.758E+00	8.978E-01	8.545E-02	1.031E-04	6.286E-15	4.064E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.042E+00	1.018E+00	9.717E-01	8.254E-01	5.179E-01	1.013E-01	9.585E-04	0.000E+00
Ni-63	Ni-63	1.000E+00	4.079E-04	4.033E-04	3.943E-04	3.644E-04	2.908E-04	1.309E-04	1.217E-05	2.466E-08
Sr-90+D	Sr-90+D	1.000E+00	4.972E-01	4.492E-01	3.666E-01	1.799E-01	1.395E-01	1.877E-04	2.458E-13	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	5.415E+00	6.177E+00	8.037E+00	2.020E+01	2.811E+02	2.827E+06	*1.113E+15	*1.113E+15
Cs-134	1.016E+01	1.422E+01	2.785E+01	2.926E+02	2.425E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.399E+01	2.456E+01	2.573E+01	3.029E+01	4.827E+01	2.467E+02	2.608E+04	*8.593E+13
Ni-63	6.130E+04	6.199E+04	6.340E+04	6.860E+04	8.598E+04	1.910E+05	2.055E+06	1.014E+09
Sr-90	5.028E+01	5.565E+01	6.820E+01	1.390E+02	1.792E+02	1.332E+05	1.017E+14	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	4.617E+00	5.415E+00	4.617E+00	5.415E+00
Cs-134	1.000E+00	0.000E+00	2.460E+00	1.016E+01	2.460E+00	1.016E+01
Cs-137	1.000E+00	0.000E+00	1.042E+00	2.399E+01	1.042E+00	2.399E+01
Ni-63	1.000E+00	0.000E+00	4.079E-04	6.130E+04	4.079E-04	6.130E+04
Sr-90	1.000E+00	0.000E+00	4.972E-01	5.028E+01	4.972E-01	5.028E+01

RESRAD Run Page 18 for 300 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days          12/06/2014  16:14  Page  18
Summary : Zion Subsurface Soil 300 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.033E+00	4.412E+00	3.391E+00	1.349E+00	9.691E-02	9.628E-06	3.522E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	2.721E+00	1.944E+00	9.929E-01	9.448E-02	1.139E-04	6.929E-15	4.344E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.177E+00	1.150E+00	1.097E+00	9.318E-01	5.839E-01	1.138E-01	1.062E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	1.224E-03	1.210E-03	1.183E-03	1.093E-03	8.722E-04	3.926E-04	3.650E-05	9.113E-08
Sr-90+D	Sr-90+D	1.000E+00	1.478E+00	1.335E+00	1.090E+00	5.346E-01	2.739E-01	6.299E-04	8.256E-13	0.000E+00

The DSR includes contributions from associated (half-life < 30 days) 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
Co-60	4.967E+00	5.666E+00	7.373E+00	1.853E+01	2.580E+02	2.596E+06	*1.113E+15	*1.113E+15
Cs-134	9.187E+00	1.286E+01	2.518E+01	2.646E+02	2.195E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	2.124E+01	2.174E+01	2.278E+01	2.683E+01	4.281E+01	2.198E+02	2.354E+04	*8.593E+13
Ni-63	2.043E+04	2.066E+04	2.113E+04	2.287E+04	2.866E+04	6.368E+04	6.850E+05	2.743E+08
Sr-90	1.691E+01	1.872E+01	2.294E+01	4.677E+01	9.127E+01	3.969E+04	3.028E+13	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.033E+00	4.967E+00	5.033E+00	4.967E+00
Cs-134	1.000E+00	0.000E+00	2.721E+00	9.187E+00	2.721E+00	9.187E+00
Cs-137	1.000E+00	0.000E+00	1.177E+00	2.124E+01	1.177E+00	2.124E+01
Ni-63	1.000E+00	0.000E+00	1.224E-03	2.043E+04	1.224E-03	2.043E+04
Sr-90	1.000E+00	0.000E+00	1.478E+00	1.691E+01	1.478E+00	1.691E+01

RESRAD Run Page 18 for 1000 m^2 Contamination Area

```
RESRAD, Version 7.0      T½ Limit = 30 days         12/06/2014  16:12  Page  18
Summary : Zion Subsurface Soil 1,000 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.449E+00	4.776E+00	3.670E+00	1.460E+00	1.048E-01	1.038E-05	3.764E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	3.081E+00	2.202E+00	1.124E+00	1.069E-01	1.286E-04	7.762E-15	4.624E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.418E+00	1.385E+00	1.322E+00	1.121E+00	6.998E-01	1.346E-01	1.209E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	4.078E-03	4.033E-03	3.943E-03	3.644E-03	2.907E-03	1.309E-03	1.217E-04	3.568E-07
Sr-90+D	Sr-90+D	1.000E+00	4.909E+00	4.435E+00	3.619E+00	1.776E+00	6.190E-01	2.704E-03	3.554E-12	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.588E+00	5.234E+00	6.812E+00	1.713E+01	2.386E+02	2.409E+06	*1.113E+15	*1.113E+15
Cs-134	8.113E+00	1.135E+01	2.224E+01	2.339E+02	1.945E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.763E+01	1.805E+01	1.892E+01	2.231E+01	3.572E+01	1.857E+02	2.067E+04	*8.593E+13
Ni-63	6.130E+03	6.199E+03	6.340E+03	6.860E+03	8.599E+03	1.910E+04	2.055E+05	7.007E+07
Sr-90	5.093E+00	5.636E+00	6.908E+00	1.408E+01	4.039E+01	9.246E+03	7.034E+12	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.449E+00	4.588E+00	5.449E+00	4.588E+00
Cs-134	1.000E+00	0.000E+00	3.081E+00	8.113E+00	3.081E+00	8.113E+00
Cs-137	1.000E+00	0.000E+00	1.418E+00	1.763E+01	1.418E+00	1.763E+01
Ni-63	1.000E+00	0.000E+00	4.078E-03	6.130E+03	4.078E-03	6.130E+03
Sr-90	1.000E+00	0.000E+00	4.909E+00	5.093E+00	4.909E+00	5.093E+00

RESRAD Run Page 18 for 3000 m^2 Contamination Area

```
RESRAD, Version 7.0      T% Limit = 30 days        12/06/2014  16:11  Page  18
Summary : Zion Subsurface Soil 3,000 m^2 120614
File    : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD
```

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.607E+00	4.915E+00	3.777E+00	1.502E+00	1.078E-01	1.067E-05	3.862E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	3.299E+00	2.357E+00	1.203E+00	1.144E-01	1.374E-04	6.269E-15	4.764E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.568E+00	1.531E+00	1.460E+00	1.238E+00	7.718E-01	1.477E-01	1.304E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	6.446E-03	6.374E-03	6.233E-03	5.762E-03	4.601E-03	2.077E-03	1.960E-04	7.268E-07
Sr-90+D	Sr-90+D	1.000E+00	5.313E+00	4.801E+00	3.917E+00	1.922E+00	9.374E-01	1.180E-02	1.560E-11	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.459E+00	5.087E+00	6.620E+00	1.664E+01	2.319E+02	2.343E+06	*1.113E+15	*1.113E+15
Cs-134	7.578E+00	1.061E+01	2.078E+01	2.186E+02	1.819E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.595E+01	1.633E+01	1.712E+01	2.019E+01	3.239E+01	1.693E+02	1.917E+04	*8.593E+13
Ni-63	3.878E+03	3.922E+03	4.011E+03	4.339E+03	5.434E+03	1.204E+04	1.276E+05	3.440E+07
Sr-90	4.705E+00	5.208E+00	6.383E+00	1.301E+01	2.667E+01	2.119E+03	1.602E+12	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.607E+00	4.459E+00	5.607E+00	4.459E+00
Cs-134	1.000E+00	0.000E+00	3.299E+00	7.578E+00	3.299E+00	7.578E+00
Cs-137	1.000E+00	0.000E+00	1.568E+00	1.595E+01	1.568E+00	1.595E+01
Ni-63	1.000E+00	0.000E+00	6.446E-03	3.878E+03	6.446E-03	3.878E+03
Sr-90	1.000E+00	0.000E+00	5.313E+00	4.705E+00	5.313E+00	4.705E+00

RESRAD, Version 7.0 T% Limit = 30 days 12/06/2014 16:09 Page 18
Summary : Zion Subsurface Soil 10,000 m^2 120614
File : C:\RESRAD_FAMILY\RESRAD\7.0\USERFILES\ZION SUBSURFACE SOIL DCGL.RAD

RESRAD Run Page 18 for 10000 m^2 Contamination Area

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Co-60	Co-60	1.000E+00	5.932E+00	5.200E+00	3.995E+00	1.589E+00	1.139E-01	1.125E-05	4.044E-17	0.000E+00
Cs-134	Cs-134	1.000E+00	3.933E+00	2.809E+00	1.434E+00	1.361E-01	1.631E-04	9.713E-15	4.905E-44	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	2.037E+00	1.989E+00	1.897E+00	1.606E+00	9.973E-01	1.881E-01	1.587E-03	0.000E+00
Ni-63	Ni-63	1.000E+00	1.473E-02	1.457E-02	1.425E-02	1.317E-02	1.053E-02	4.767E-03	4.560E-04	1.383E-06
Sr-90+D	Sr-90+D	1.000E+00	6.726E+00	6.078E+00	4.959E+00	2.433E+00	1.244E+00	6.987E-02	9.348E-11	0.000E+00

The DSR includes contributions from associated (half-life ≤ 30 days) 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
Co-60	4.214E+00	4.808E+00	6.257E+00	1.574E+01	2.195E+02	2.222E+06	*1.113E+15	*1.113E+15
Cs-134	6.357E+00	8.899E+00	1.744E+01	1.836E+02	1.532E+05	*1.283E+15	*1.283E+15	*1.283E+15
Cs-137	1.227E+01	1.257E+01	1.318E+01	1.557E+01	2.507E+01	1.329E+02	1.575E+04	*8.593E+13
Ni-63	1.697E+03	1.716E+03	1.755E+03	1.898E+03	2.375E+03	5.244E+03	5.482E+04	1.807E+07
Sr-90	3.717E+00	4.113E+00	5.041E+00	1.027E+01	2.009E+01	3.578E+02	2.674E+11	*1.366E+14

*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 = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Co-60	1.000E+00	0.000E+00	5.932E+00	4.214E+00	5.932E+00	4.214E+00
Cs-134	1.000E+00	0.000E+00	3.933E+00	6.357E+00	3.933E+00	6.357E+00
Cs-137	1.000E+00	0.000E+00	2.037E+00	1.227E+01	2.037E+00	1.227E+01
Ni-63	1.000E+00	0.000E+00	1.473E-02	1.697E+03	1.473E-02	1.697E+03
Sr-90	1.000E+00	0.000E+00	6.726E+00	3.717E+00	6.726E+00	3.717E+00