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Re-Evaluation of Breckenridge DCGLs, Gamma Scan Sensitivity, and Gamma Scan Action Levels and Development of Area Factors

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ABBREVIATIONS and ACRONYMS

µCi	microCuries
Ac	actinium
AF	area factor
Bi	bismuth
cm	centimeter
cm^3	cubic centimeters
cpm	counts per minute
DCGL	derived concentration guideline level
DSR	dose-to-source ratio
EMC	Elevated Measurement Comparison
Energy*Solutions*	Energy*Solutions*, LLC
EPA	Environmental Protection Agency
FSS	final status survey
keV	kilo-electron volts
m^2	square meters
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual (NUREG-1575)
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
MDER	minimum detectable exposure rate
mrem/yr	millirem per year
NaI	sodium iodide
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
Pa	protactinium
Pb	lead
pCi/g	picoCuries per gram
Po	polonium
Ra	radium
Rn	radon
SOF	sum of fractions

ABBREVIATIONS and ACRONYMS (continued)

SU	survey unit
TEDE	total effective dose equivalent
Th	thorium
Tl	thallium
U	uranium
UCL	upper confidence level

1.0 EXECUTIVE SUMMARY

With the recent identification of elevated Th-230 as compared to U-238 and Th-232, the 2006 derived concentration guideline level (DCGL) models are no longer adequate for demonstrating compliance to the total effective dose equivalent (TEDE) limit of 25 millirem per year (mrem/yr). These DCGLs were independently re-evaluated using RESRAD models to determine the DCGLs for each radionuclide, or decay chain, corresponding to 25 mrem/yr. Table 1-1 provides the re-evaluated DCGLs for use with the unity (sum of fractions) rule for demonstrating the release of the site.

Table 1-1: Re-Evaluated DCGLs

Radionuclide	DCGL (pCi/g)	
	Surface	Subsurface
Th-232+C	5.0	65.9
U-238+D	442.4	8,658
U-234	2,729	6,113
Th-230	276.9	97.9
Ra-226+C	6.2	51.2

The unity rule as provided below (Equation 1-1) will be used to demonstrate compliance to the revised DCGLs provided above. It should be noted that U-238 is a surrogate for U-234 with a demonstrated 1:1 ratio (secular equilibrium).

$$SOF = \frac{C_{Th-232}}{DCGL_{Th-232+C}} + \frac{C_{U-238}}{DCGL_{U-238+D}} + \frac{C_{U-238}}{DCGL_{U-234}} + \frac{C_{Th-230}}{DCGL_{Th-230}} + \frac{C_{Ra-226}}{DCGL_{Ra-226+C}} \quad (1\text{-}1)$$

The concentration of Th-232 may serve as a surrogate for Th-230 provided Th-230 is not directly measured during sample analysis. Using analytical data, a ratio between Th-230 and Th-232 was demonstrated to be approximately 9.8:1. For simplicity, instead of modifying the Th-232+C DCGL, the Th-230 to Th-232 ratio and Th-232 concentration will be used in the Th-230 term of Equation 1-1. The revised Th-230 term is illustrated below.

$$\frac{C_{Th-230}}{DCGL_{Th-230}} = \frac{R_{Th-230:Th-232} \times C_{Th-232}}{DCGL_{Th-230}} \quad (1\text{-}2)$$

The minimum detectable concentrations (MDCs) for scanning as provided in NUREG-1507 Table 6.4 are adequately sensitive for every radionuclide as listed in Table 1-1 except for Th-230. To account for the lack of scan sensitivity for Th-230, Th-232 will be used as a surrogate for Th-230 as addressed in the unity equation above. A modified Th-232 DCGL was calculated using Equation I-14 of MARSSIM (NUREG-1575) and a Th-230 to Th-232 ratio of 9.8:1. The equation is provided below.

$$DCGL_{Th-232_{Mod}} = \frac{1}{\frac{1}{DCGL_{Th-232}} + \frac{R_{Th-230:Th-232}}{DCGL_{Th-230}}} \quad (1\text{-}3)$$

The modified Th-232 DCGL was calculated to be 4.2 pCi/g and 8.7 pCi/g for Surface and Subsurface, respectively. The Th-232 scan MDC of 1.8 pCi/g is less than both modified DCGLs and therefore adequate sensitivity can be demonstrated using the re-evaluated DCGLs with Th-232 accounting for the dose from Th-230.

Scan action levels were developed using two different methodologies including analysis of empirical field data and the use of MicroShield® modeling to develop a field efficiency for an elevated area equal in size to the bounded area between final status survey (FSS) samples. The results were 18,000 gross cpm and 31,000 gross cpm for Surface and Subsurface, respectively.

Sections 2.5.1.1 and 5.5.2.4 of MARSSIM addresses the concern of small areas of elevated activity within the survey unit. A simple comparison to an investigation level ($DCGL_{EMC}$) is used to assess the impact of potential elevated areas. The $DCGL_{EMC}$ is the DCGL modified by an area factor (AF) to account for the dose from the small area of the elevated activity. The AFs for the radionuclides of concern are provided in Table 1-2.

Table 1-2: Area Factors

Radionuclide	Contaminated Zone Area (m^2)									
	3,800	3,000	1,000	600	300	100	30	10	3	1
Surface										
Th-232+C	1.0	1.0	1.0	--	1.2	1.3	1.7	2.5	5.3	12.4
U-238+D	1.0	1.0	1.1	--	1.2	1.4	1.8	2.6	5.4	12.4
U-234	1.0	1.1	1.2	--	3.8	9.8	23.6	44.0	82.7	130
Th-230	1.0	1.0	1.1	--	1.3	1.6	2.2	3.5	7.4	17.0
Ra-226+C	1.0	1.0	1.0	--	1.3	1.5	1.9	2.8	6.0	14.1
Subsurface										
Th-232+C	--	--	--	1.0	1.9	4.5	8.7	12.9	27.3	54.9
U-238+D	--	--	--	1.0	2.0	5.7	16.3	36.0	38.8	38.8
U-234	--	--	--	1.0	2.0	5.9	18.6	49.0	143	367
Th-230	--	--	--	1.0	2.0	5.6	15.5	32.9	81.6	179
Ra-226+C	--	--	--	1.0	2.0	5.6	15.6	33.1	82.1	181

2.0 BRECKENRIDGE DCGLS REVISED IN 2006

The dose assessment performed to establish the Breckenridge DCGLs was revised by Environ in 2006[1]. Table 6 from the Environ report is provided as Table 2-1 below.

Table 2-1: 2006 DCGLs

Isotope	DCGL (pCi/gram)	
	Surface	Subsurface
Thorium 232+D	3.9	34.0
Uranium 238 and U234	2.5	21.5
Radium 226 and Lead 210	1.3	10.5

[1] Letter to Dr. Peter Lee (NRC) from Environ International Corporation; Subject: Revised Dose Assessment Methodology, Breckenridge Disposal Site, St. Louis, Michigan; April 25, 2006.

The 2006 development assumed that the Ra-226 was at 50% equilibrium with the U-238. Table 3 of the 2007 Supplemental Site Characterization Report prepared by Environ provided DCGLs when Ra-226 and U-238 are less than 50% equilibrium (2006 DCGLs) and when Ra-226 and U-238 are greater than 50% equilibrium. For the greater than 50% equilibrium, the U-238 DCGL was reduced and set equal to the Ra-226 DCGL. These values were determined assuming that Th-230 was in equilibrium with U-238. Subsequent sample analyses in 2010 have demonstrated that this is not the case and as a result, these DCGLs are no longer adequate in determining site compliance; therefore, the DCGLs have been re-evaluated.

3.0 RE-EVALUATION OF BRECKENRIDGE DCGLS

With the recent identification of elevated Th-230 as compared to U-238 and Th-232, the 2006 DCGL models were no longer adequate in demonstrating compliance to the TEDE limit of 25 mrem/yr. The DCGLs were independently re-evaluated using RESRAD models to determine the DCGLs for each radionuclide, or decay chain, corresponding to 25 mrem/yr for use with the unity (sum of fractions) rule.

3.1 DEVELOPMENT OF CHAIN DCGLS

The 2006 RESRAD v6.3 models were re-entered into RESRAD v6.4 and verified to provide the same results as documented in the 2006 report. This ensured comparability to the previous RESRAD version. Next, the Surface and Subsurface models were divided into four separate models to independently account for the dose from the decay chains Th-232+C, U-238+C, Th-230+C, and Ra-226+C, where the contemporary +C nomenclature indicates that the dose of all progeny in equilibrium is accounted for in the model. The only RESRAD parameters that were modified were the selected radionuclides and their concentrations. The list below shows the radionuclides with half-lives greater than 180 days that were included at 1 pCi/g for each revised model.

- **Th-232+C**: Th-232, Ra-228, and Th-228
- **U-238+C**: U-238, U-234, Th-230, Ra-226, and Pb-210
- **Th-230+C**: Th-230, Ra-226, and Pb-210
- **Ra-226+C**: Ra-226 and Pb-210

Table 3-1 lists the attachment that provides each RESRAD Summary Report.

Table 3-1: DCGL RESRAD Summary Report Attachment Matrix

Model	Attachment	
	Surface	Subsurface
Th-232+C	A	E
U-238+C	B	F
Th-230+C	C	G
Ra-226+C	D	H

The DCGLs for the four chains noted above were calculated by developing a dose-to-source ratio (DSR) for each model. This was calculated by dividing the TEDE of 25 mrem/yr by the reported "Maximum TDOSE(t)" from the RESRAD Summary Report. Figure 3-1 shows the Maximum TDOSE(t) for U-238+C for the Surface model (Page 9 of the RESRAD Summary Report provided in Attachment B).

```
RESRAD, Version 6.4      T½ Limit = 180 days        11/15/2010  15:24  Page   9
Summary : Breckenridge Surface U-238+C
File    : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.RAD

     Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g

       Area:   3800.00 square meters                Pb-210     1.000E+00
  Thickness:      0.15 meters                       Ra-226     1.000E+00
Cover Depth:      0.00 meters                       Th-230     1.000E+00
                                                    U-234      1.000E+00
                                                    U-238      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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  4.096E+00  4.080E+00  2.066E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
        M(t):  1.638E-01  1.632E-01  8.263E-02  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00

Maximum TDOSE(t):  4.096E+00 mrem/yr   at t = 0.000E+00 years
```

Figure 3-1: Maximum TDOSE(t) from Surface U-238+C RESRAD Summary Report

Therefore, for the Surface model, the U-238+C DSR is equal to [4.096 mrem/yr] / [1 pCi/g U-238] = 4.096 mrem/yr per pCi/g U-238. Using this DSR, the U-238 DCGL was determined to be equal to [25 mrem/yr] / [4.096 mrem/yr per pCi/g U-238] = 6.1 pCi/g. Table 3-2 provides the DSR and DCGL for each chain as listed for both the Surface and Subsurface models.

Table 3-2: DSRs and DCGLs for Decay Chains

Chain	Surface		Subsurface	
	DSR (mrem/yr per pCi/g)	DCGL (pCi/g)	DSR (mrem/yr per pCi/g)	DCGL (pCi/g)
Th-232+C	5.014	5.0	0.3793	65.9
U-238+C	4.096	6.1	0.7506	33.3
Th-230+C	4.030	6.2	0.7437	33.6
Ra-226+C	4.019	6.2	0.4882	51.2

3.2 DEVELOPMENT OF INDIVIDUAL DCGLS

Because Th-230 was not in equilibrium with the U-238 (and in fact was greater than the U-238 level) and the Ra-226 was also not in equilibrium with U-238, the Th-232+C and Ra-226+C DCGLs from Table 3-2 were the only chains that could be directly implemented. To account for the dose from remaining portions of the U-238 chain not accounted for in the Ra-226+C DCGL, DCGLs were developed for U-234, U-238+D, and Th-230, where the contemporary +D

nomenclature indicates that the dose of all short-lived progeny (half-life less than 180 days) of the parent is accounted for in the model.

The development of these additional DCGLs did not require additional RESRAD models. The DSRs and DCGLs were taken directly from the U-238+C report section "Single Radionuclide Soil Guidelines." This section of the Surface model report is shown in Figure 3-2 (Page 21 of the RESRAD Summary Report provided in Attachment B).

```
RESRAD, Version 6.4      T½ Limit = 180 days        11/15/2010  15:24  Page  21
Summary : Breckenridge Surface U-238+C
File    : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.RAD

            Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
            and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
         at tmin = time of minimum single radionuclide soil guideline
     and at tmax = time of maximum total dose = 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)
Pb-210	1.000E+00	0.000E+00	4.486E-01	5.573E+01	4.486E-01	5.573E+01
Ra-226	1.000E+00	2.050 ± 0.004	3.572E+00	7.000E+00	3.570E+00	7.003E+00
Th-230	1.000E+00	87.7 ± 0.2	9.030E-02	2.769E+02	1.166E-02	2.145E+03
U-234	1.000E+00	0.000E+00	9.162E-03	2.729E+03	9.162E-03	2.729E+03
U-238	1.000E+00	0.000E+00	5.650E-02	4.424E+02	5.650E-02	4.424E+02

Figure 3-2: Individual DCGLs from Surface U-238+C RESRAD Summary Report

Table 3-3 summarizes the Surface and Subsurface U-234, U-238+D, and Th-230 DSRs and DCGLs.

Table 3-3: DSRs and DCGLs for Individual Radionuclides

Radionuclide	Surface		Subsurface	
	DSR (mrem/yr per pCi/g)	DCGL (pCi/g)	DSR (mrem/yr per pCi/g)	DCGL (pCi/g)
U-234	9.162E-03	2,729	4.090E-03	6,113
U-238+D	5.650E-02	442.4	2.887E-03	8,658
Th-230	9.030E-02	276.9	0.2555	97.9

3.3 FINAL DCGLS

Because the Th-232 decay chain is in equilibrium, the Th-232+C DCGL accounts for all dose from the entire chain. If all the DCGLs discussed in the U-238 decay chain were implemented, the dose for several radionuclides would be accounted for twice. In order to properly account for the U-238 decay chain dose, several DCGL permutation options could be implemented. Options for demonstrating compliance for the U-238 decay chain, with respect to the long-lived radionuclides that were entered into the RESRAD models, are illustrated below.

Long-Lived Radionuclide:	U-238	U-234	Th-230	Ra-226	Pb-210
Option 1:	U-238+C				
Option 2:	U-238+D	U-234	Th-230+C		
Option 3:	U-238+D	U-234	Th-230	Ra-226+C	

As discussed in the Section 3.0, Th-230 is not in equilibrium with U-238 nor Ra-226. Therefore, Option 3 above was selected as the most appropriate model. Table 3-4 provides the re-evaluated DCGLs that will be implemented.

Table 3-4: Re-Evaluated DCGLs

Radionuclide	DCGL (pCi/g)	
	Surface	Subsurface
Th-232+C	5.0	65.9
U-238+D	442.4	8,658
U-234	2,729	6,113
Th-230	276.9	97.9
Ra-226+C	6.2	51.2

For quality control, the re-evaluated RESRAD models were compared to the RESRAD Summary Reports provided in the Appendix of the 2006 Environ report and confirmed to be entered with identical parameters except for the selected radionuclides and concentrations which followed the technical discussion in this document.

3.4 AREA FACTORS

Sections 2.5.1.1 and 5.5.2.4 of MARSSIM addresses the concern of small areas of elevated activity in the survey unit. Rather than using statistical methods, a simple comparison to an investigation level is used to assess the impact of potential elevated areas. The investigation level for this comparison is the $DCGL_{EMC}$, which is the DCGL modified by an AF to account for the small area of the elevated activity. The area correction is used because the exposure assumptions are the same as those used to develop the DCGL. Note that the consideration of small areas of elevated activity applies only to Class 1 survey units as Class 2 and 3 survey units should not have contamination in excess of the DCGL.

First, the $DCGL_{EMC}$ values were developed by using the RESRAD models and adjusting the size of the Surface contaminated zone to 1, 3, 10, 30, 100, 300, 1,000, and 3,000 m^2 and Subsurface contaminated zone to 1, 3, 10, 30, 100, and 300 m^2. Table 3-5 provides the $DCGL_{EMC}$ values, in pCi/g.

Lastly, the resulting $DCGL_{EMC}$ for the smaller areas of activity was then divided by the applicable DCGL (contaminated zone area size of 3,800 m^2 for Surface and 600 m^2 for Subsurface) to determine the corresponding AF. The AF calculation is illustrated below for U-234 for a Surface contaminated area size of 300 m^2.

$$AF = \frac{DCGL_{EMC}}{DCGL} = \frac{10{,}370\ pCi/g}{2{,}729\ pCi/g} = 3.8$$

The AFs are provided in Table 3-6. The Surface and Subsurface AFs are plotted on Figure 3-3 and Figure 3-4, respectively.

Table 3-5: $DCGL_{EMC}$ Values

Radionuclide	Contaminated Zone Area (m^2)									
	3,800	3,000	1,000	600	300	100	30	10	3	1
Surface										
Th-232+C	5.0	5.0	5.1	--	5.8	6.5	8.5	12.6	26.6	62.1
U-238+D	442.4	448.1	465.0	--	542.4	612.3	791.8	1,146	2,403	5,466
U-234	2,729	2,873	3,314	--	10,370	26,820	64,280	120,200	225,700	355,200
Th-230	276.9	280.2	291.3	--	356.6	431.5	613.0	955.9	2,039	4,834
Ra-226+C	6.2	6.3	6.5	--	7.8	9.0	11.9	17.6	37.4	87.3
Subsurface										
Th-232+C	--	--	--	65.9	123.3	293.8	572.7	849.8	1,796	3,616
U-238+D	--	--	--	8,658	17,120	49,060	141,500	311,400	336,100	336,100
U-234	--	--	--	6,113	12,180	35,940	113,400	299,800	877,100	2.241E6
Th-230	--	--	--	97.9	192.8	545.6	1,520	3,221	7,984	17,550
Ra-226+C	--	--	--	51.2	100.9	285.7	796.9	1,693	4,202	9,242

Table 3-6: Area Factors

Radionuclide	Contaminated Zone Area (m^2)									
	3,800	3,000	1,000	600	300	100	30	10	3	1
Surface										
Th-232+C	1.0	1.0	1.0	--	1.2	1.3	1.7	2.5	5.3	12.4
U-238+D	1.0	1.0	1.1	--	1.2	1.4	1.8	2.6	5.4	12.4
U-234	1.0	1.1	1.2	--	3.8	9.8	23.6	44.0	82.7	130
Th-230	1.0	1.0	1.1	--	1.3	1.6	2.2	3.5	7.4	17.0
Ra-226+C	1.0	1.0	1.0	--	1.3	1.5	1.9	2.8	6.0	14.1
Subsurface										
Th-232+C	--	--	--	1.0	1.9	4.5	8.7	12.9	27.3	54.9
U-238+D	--	--	--	1.0	2.0	5.7	16.3	36.0	38.8	38.8
U-234	--	--	--	1.0	2.0	5.9	18.6	49.0	143	367
Th-230	--	--	--	1.0	2.0	5.6	15.5	32.9	81.6	179
Ra-226+C	--	--	--	1.0	2.0	5.6	15.6	33.1	82.1	181

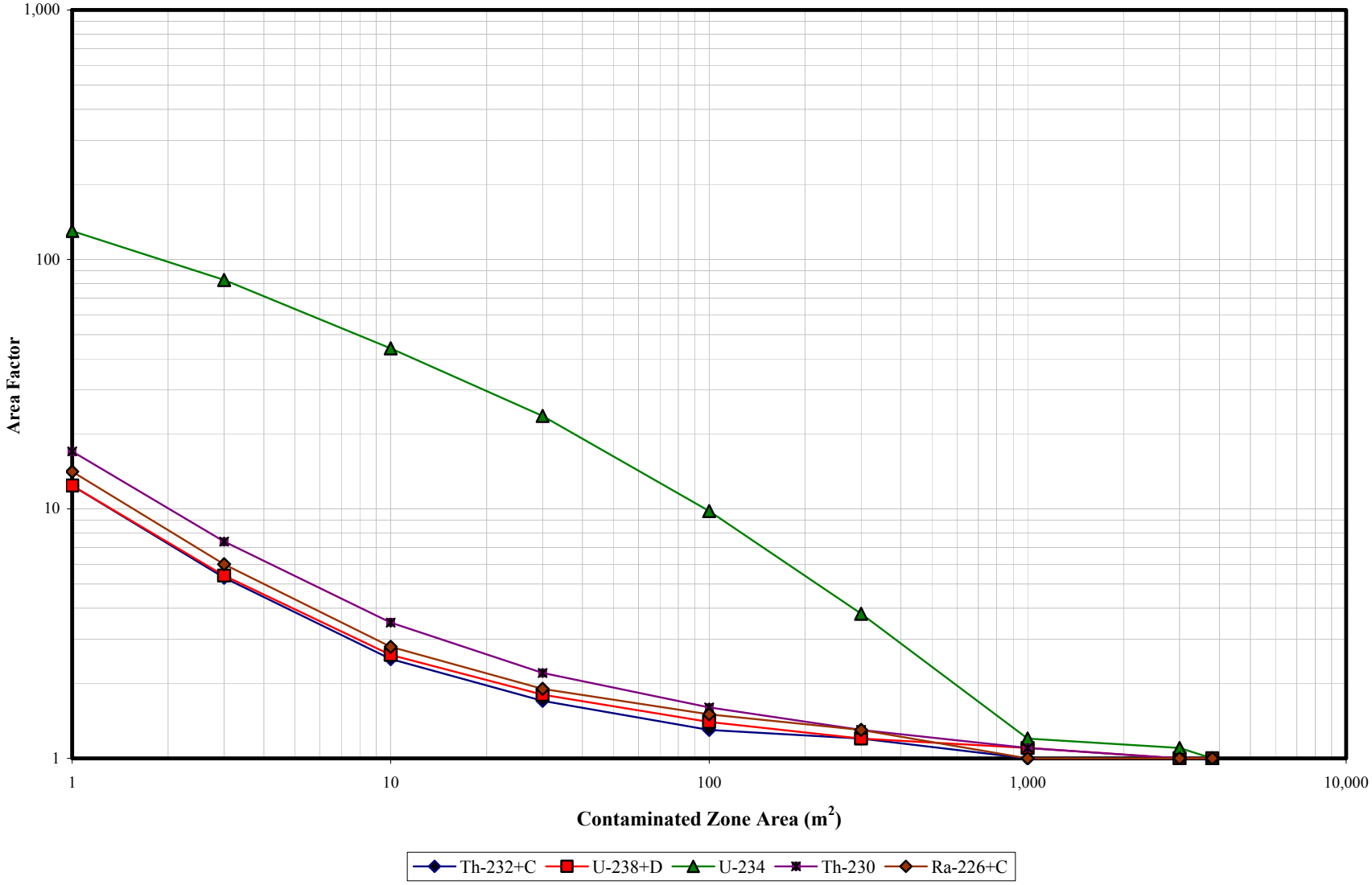

Figure 3-3: Surface Area Factors

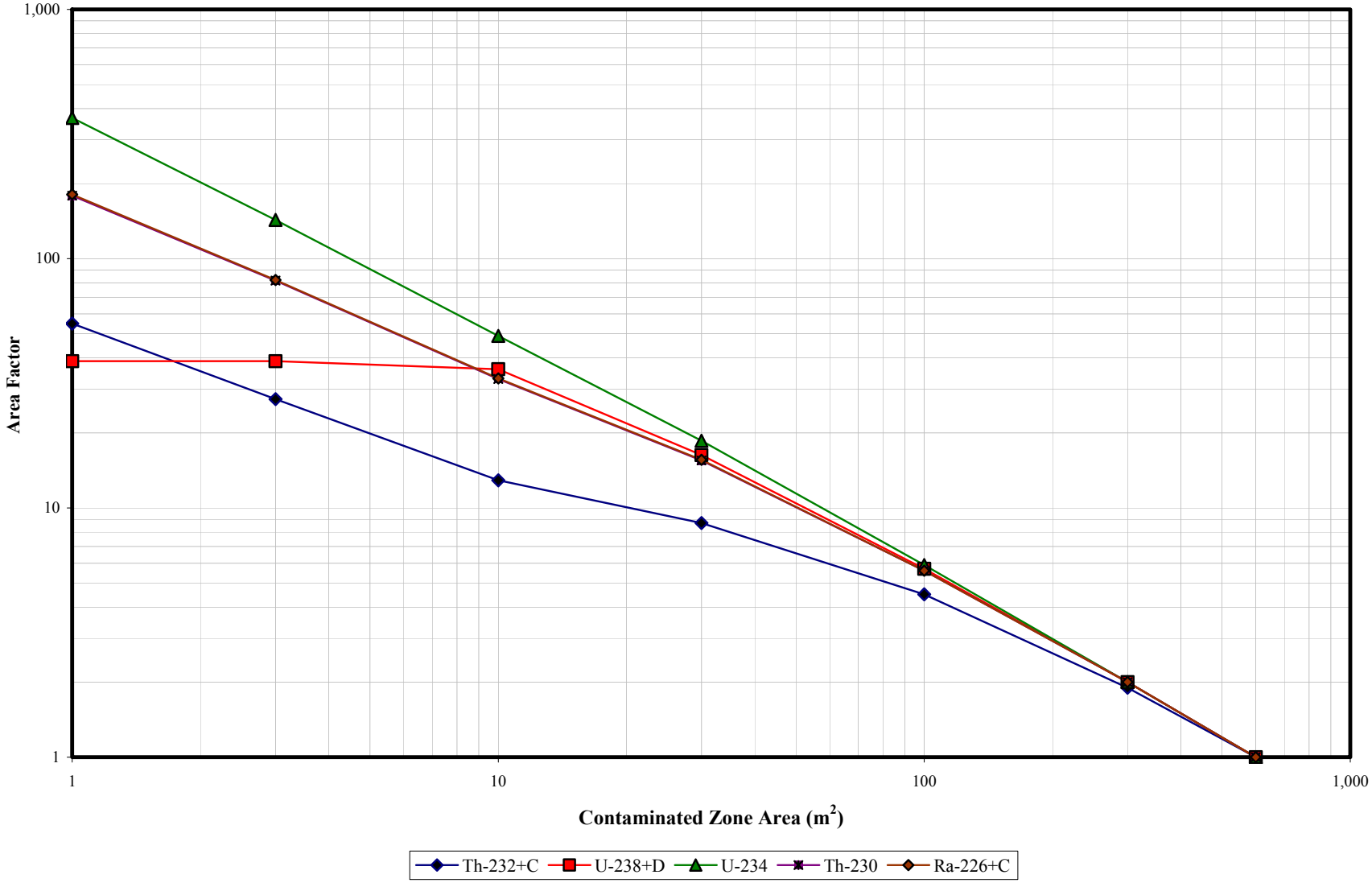

Figure 3-4: Subsurface Area Factors

The 42 individual $DCGL_{EMC}$ RESRAD Summary Reports are not included because the only parameter changed was the contaminated area. The $DCGL_{EMC}$ RESRAD Summary Reports were compared to the DCGL RESRAD Summary Reports and found to be entered correctly.

4.0 SCAN SENSITIVITY

The scan sensitivity was evaluated first using the scan MDCs as documented and provided in NUREG-1507 Table 6.4 and secondly by developing specific scan MDCs using the guidance as provided in NUREG-1507 Section 6. The results of both evaluations are discussed in the following sections.

4.1 INDIVIDUAL SCAN MDCS

4.1.1 NUREG-1507 Table 6.4 MDCs

As shown in Table 4-1, the scan MDCs for a 2-inch by 2-inch sodium iodide (NaI) detector as provided in NUREG-1507 Table 6.4 are adequately sensitive for every radionuclide except for Th-230.

Table 4-1: DCGLs and Applicable Scan MDCs from NUREG-1507

Radionuclide	DCGL (pCi/g)		Scan MDC (pCi/g) [a]
	Surface	Subsurface	
Th-232+C	5.0	65.9	1.8
U-238+D	442.4	8,658	80 [b]
U-234	2,729	6,113	
Th-230	276.9	97.9	2,120
Ra-226+C	6.2	51.2	2.8

[a] Table 6.4 of NUREG-1507 for a 2" × 2" NaI detector
[b] Estimated based on processed natural uranium which includes U-234, U-235, and U-238.

4.1.2 Calculated Scan MDCs Using NUREG-1507 Guidance

<u>Calculation of Surveyor MDCR</u>

The scan MDCs were calculated using the guidance in Section 6.8.2 of NUREG-1507. First, the minimum detectable count rate (MDCR) for the surveyor, $MDCR_{surveyor}$, was calculated using the guidance provided in Section 6.7.2.1 of MARSSIM and the equation below summarizes the application of the guidance.

$$MDCR_{surveyor} = \frac{d' \times \sqrt{B \times \frac{i}{60}} \times \frac{60}{i}}{\sqrt{p}} \tag{4-1}$$

where: d′ = Index of sensitivity, MARSSIM Table 6.5 (unitless);
B = Background count rate (cpm);
i = Observation interval (seconds); and
p = Surveyor efficiency (unitless).

The $MDCR_{surveyor}$, was calculated using the following inputs:

- Index of sensitivity (d′) of 1.38 which provides a 95% true positive proportion and 60% false positive proportion,
- Background count rate of 10,000 cpm,
- Observation interval of 1 second which is equal to the data acquisition time of the electronically collected scan data, and
- Surveyor efficiency of 0.75 which is greater than the MARSSIM-recommended value of 0.5 to account for the fact that biased sampling locations are selected visually after plotting collected scan data.

The $MDCR_{surveyor}$ was calculated to be 1,234 cpm (above background) as illustrated below.

$$MDCR_{surveyor} = \frac{1.38 \times \sqrt{10{,}000 \times \frac{1}{60}} \times \frac{60}{1}}{\sqrt{0.75}} = 1{,}234 \text{ cpm}$$

<u>MicroShield® Modeling</u>

A model of a postulated small elevated area was created in MicroShield® v8.01. The model was setup with the following inputs and options consistent with the information provided on Page 6-21 of NUREG-1507:

- Cylinder Volume – End Shields;
- Height of 15 cm and radius of 28 cm;
- Dose Point #1 at x=0 cm, y=25 cm, and z=0 cm;
- Source material of concrete with a density of 1.6 grams per cubic centimeter (g/cm^3);
- Air gap with density of 0.00122 g/cm^3;
- Source activity concentration equal to 8E-6 microCuries per cubic centimeter ($\mu Ci/cm^3$) per Equation 6-19 of NUREG-1507, which is equivalent to 5 pCi/g; and
- Source input grouping method of standard indices.

Five models were created for the radionuclides listed in Table 3-4 and associated short-lived progeny, as shown below (note that all radionuclides were 100% yield and therefore the modeled activity concentration was 8E-6 $\mu Ci/cm^3$ unless other noted):

1. Th-232, Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Po-212 (64.0% yield, 5.12E-6 µCi/cm^3), and Tl-208 (36.0% yield, 2.88E-6 µCi/cm^3);
2. U-238, Th-234, and Pa-234m;
3. U-234 only;
4. Th-230 only;
5. Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, and Po-210.

The MicroShield® outputs for each model are provided in Attachment I.

Calculation of the MDER

The MicroShield® results were independently tabulated by grouped gamma energies and exposure rates for each model. Table 6.3 of NUREG-1507 provides normalized detector count rate versus exposure rate calculations based on the manufacturer's detector response to cesium-137. The exposure rate for each gamma energy group was then multiplied by the count rate versus exposure rate to determine the weighted count rate versus exposure rate for each energy and the results were summed. The minimum detectable exposure rate (MDER) was then calculated by dividing the $MDCR_{surveyor}$ by the total weighted count rate versus exposure rate per Equation 6-21 of NUREG-1507. The results are presented in Table 4-2, Table 4-3, Table 4-4, Table 4-5, and Table 4-6 for Th-232+C, U-238+D, U-234, Th-230, and Ra-226+C, respectively.

Table 4-2: MicroShield® Results and Calculation of MDER for Th-232+C

Energy (keV)	Exposure Rate(µR/hr)	cpm per µR/hr	cpm per µR/hr (weighted)
60	9.711E-04	13,000	2.601E+00
80	9.139E-02	12,000	2.259E+02
100	1.936E-02	9,840	3.925E+01
150	1.726E-02	6,040	2.148E+01
200	2.861E-01	4,230	2.493E+02
300	1.953E-01	2,520	1.014E+02
400	2.240E-02	1,700	7.846E+00
500	1.630E-01	1,270	4.265E+01
600	4.489E-01	1,010	9.341E+01
800	3.122E-01	710	4.567E+01
1000	1.232E+00	540	1.371E+02
1500	2.969E-01	350	2.141E+01
2000	3.867E-03	260	2.071E-01
3000	1.764E+00	180	6.542E+01
--	**4.854**	**--**	**1,054**
		MDER (µR/hr, NUREG-1507 Eq. 6-21):	**1.171**

Table 4-3: MicroShield® Results and Calculation of MDER for U-238+D

Energy (keV)	Exposure Rate(µR/hr)	cpm per µR/hr	cpm per µR/hr (weighted)
60	5.490E-03	13,000	1.524E+03
80	3.023E-04	12,000	7.745E+01
100	1.650E-02	9,840	3.467E+03
800	3.703E-03	710	5.614E+01
1000	2.084E-02	540	2.403E+02
--	**4.684E-02**	**--**	**5,364**
		MDER (µR/hr, NUREG-1507 Eq. 6-21):	**0.2301**

Table 4-4: MicroShield® Results and Calculation of MDER for U-234

Energy (keV)	Exposure Rate(µR/hr)	cpm per µR/hr	cpm per µR/hr (weighted)
50	1.187E-04	11,800	6.143E+03
100	1.093E-04	9,840	4.717E+03
--	**2.280E-04**	**--**	**10,860**
		MDER (µR/hr, NUREG-1507 Eq. 6-21):	**0.1137**

Table 4-5: MicroShield® Results and Calculation of MDER for Th-230

Energy (keV)	Exposure Rate(µR/hr)	cpm per µR/hr	cpm per µR/hr (weighted)
60	5.239E-04	13,000	8.440E+03
150	2.831E-04	6,040	2.119E+03
--	**8.070E-04**	**--**	**10,560**
		MDER (µR/hr, NUREG-1507 Eq. 6-21):	**0.1169**

Table 4-6: MicroShield® Results and Calculation of MDER for Ra-226+C

Energy (keV)	Exposure Rate(µR/hr)	cpm per µR/hr	cpm per µR/hr (weighted)
50	5.187E-03	11,800	1.635E+01
80	4.909E-02	12,000	1.574E+02
100	3.704E-04	9,840	9.738E-01
200	5.673E-02	4,230	6.411E+01
300	1.572E-01	2,520	1.058E+02
400	3.774E-01	1,700	1.714E+02
500	2.150E-02	1,270	7.295E+00
600	6.794E-01	1,010	1.833E+02
800	1.693E-01	710	3.212E+01
1000	6.775E-01	540	9.775E+01
1500	5.660E-01	350	5.293E+01
2000	9.831E-01	260	6.829E+01
--	**3.743**	**--**	**957.8**
		MDER (µR/hr, NUREG-1507 Eq. 6-21):	**1.289**

The MDER calculations are illustrated below.

$$\text{MDER}_{\text{Th-232+C}} = \frac{1{,}234 \text{ cpm}}{1{,}054 \text{ cpm per } \mu\text{R/hr}} = 1.171\ \mu\text{R/hr}$$

$$\text{MDER}_{\text{U-238+D}} = \frac{1{,}234 \text{ cpm}}{5{,}364 \text{ cpm per } \mu\text{R/hr}} = 0.2301\ \mu\text{R/hr}$$

$$\text{MDER}_{\text{U-234}} = \frac{1{,}234 \text{ cpm}}{10{,}860 \text{ cpm per } \mu\text{R/hr}} = 0.1137\ \mu\text{R/hr}$$

$$\text{MDER}_{\text{Th-230}} = \frac{1{,}234 \text{ cpm}}{10{,}560 \text{ cpm per } \mu\text{R/hr}} = 0.1169\ \mu\text{R/hr}$$

$$\text{MDER}_{\text{Ra-226+C}} = \frac{1{,}234 \text{ cpm}}{957.8 \text{ cpm per } \mu\text{R/hr}} = 1.289\ \mu\text{R/hr}$$

Calculated Scan MDCs

The scan MDC for each radionuclide was then calculated using Equation 6-22 of NUREG-1507 using the results provided above. The scan MDC calculations are illustrated below. Note that the value of 5 pCi/g equates to the modeled source activity concentration.

$$\text{Scan MDC}_{\text{Th-232+C}} = (5 \text{ pCi/g}) \times \frac{1.171\ \mu\text{R/hr}}{4.854\ \mu\text{R/hr}} = 1.2 \text{ pCi/g}$$

$$\text{Scan MDC}_{\text{U-238+D}} = (5 \text{ pCi/g}) \times \frac{0.2301\ \mu\text{R/hr}}{4.684\text{E-02}\ \mu\text{R/hr}} = 24.6 \text{ pCi/g}$$

$$\text{Scan MDC}_{\text{U-234}} = (5 \text{ pCi/g}) \times \frac{0.1137\ \mu\text{R/hr}}{2.280\text{E-04}\ \mu\text{R/hr}} = 2{,}492 \text{ pCi/g}$$

$$\text{Scan MDC}_{\text{Th-230}} = (5 \text{ pCi/g}) \times \frac{0.1169\ \mu\text{R/hr}}{8.070\text{E-04}\ \mu\text{R/hr}} = 724.3 \text{ pCi/g}$$

$$\text{Scan MDC}_{\text{Ra-226+C}} = (5 \text{ pCi/g}) \times \frac{1.289\ \mu\text{R/hr}}{3.743\ \mu\text{R/hr}} = 1.7 \text{ pCi/g}$$

Summary

As shown in Table 4-7, the scan MDCs for a 2-inch by 2-inch NaI detector calculated using NUREG-1507 guidance are adequately sensitive for every radionuclide except for Th-230 and in fact are lower than the values provided in NUREG-1507 Table 6.4.

Table 4-7: DCGLs and Calculated Scan MDCs Using NUREG-1507 Guidance

Radionuclide	DCGL (pCi/g)		Scan MDC (pCi/g)
	Surface	Subsurface	
Th-232+C	5.0	65.9	1.2
U-238+D	442.4	8,658	24.6
U-234	2,729	6,113	2,496
Th-230	276.9	97.9	724.3
Ra-226+C	6.2	51.2	1.7

4.2 ACCOUNTING FOR TH-230

To account for the lack of scan sensitivity for Th-230, Th-232 will be used as a surrogate for Th-230. The Th-232 DCGL will be modified and the Th-232 scan MDC will be compared to the modified Th-232 DCGL. Equation I-14 of MARSSIM, which can be used to modify the Th-232 DCGL to account for the dose from Th-230, is shown below in the applicable form.

$$DCGL_{Th-232_{Mod}} = \frac{1}{\frac{1}{DCGL_{Th-232}} + \frac{R_{Th-230:Th-232}}{DCGL_{Th-230}}} \quad (4\text{-}1)$$

All the variables in Equation 4-1 are known except for the ratio of Th-230 to Th-232 ($R_{Th-230:Th-232}$). Biased samples were recently collected by the Nuclear Regulatory Commission (NRC) and Energy*Solutions* and analyzed by the Oak Ridge Institute for Science and Education (ORISE) and ALS Environmental, respectively, by alpha spectroscopy for isotopic thorium and uranium. Table 4-8 provides the isotopic thorium results and the calculated $R_{Th-230:Th-232}$ for each sample.

Table 4-8: Isotopic Thorium Results and Th-230 to Th-232 Ratios

Sample ID	Alpha Spec Result (pCi/g)		$R_{Th-230:Th-232}$
	Th-230	Th-232	
ORISE Samples			
2030S0004	3.75	0.86	4.4
2030S0006	49.8	5.54	9.0
2030S0007	22.6	2.85	7.9
2030S0009	71.8	7.5	9.6
2030S0010	592	59.9	9.9
EnergySolutions Samples			
SU3FSSB001	61	7.1	8.6
SU3FSSB006	80	9.1	8.8
SU3CWA4B03	22.2	2.85	7.8
SU3CWA4B07	148	15.2	9.7
SU3CWA5B08	126	11.6	10.9
SU3CWA7B02	131	13	10.1

Figure 4-1 shows the data in Table 4-8 plotted as ordered observations versus theoretical quantiles and clearly shows that the result for ORISE sample 2030S0004 ($R_{Th\text{-}230:Th\text{-}232} = 4.4$) is an outlier in the data set. Figure 4-2 shows the data set with the result from ORISE sample 2030S0004 removed and the correlation is improved from 0.91 to 0.99; therefore, the result from ORISE sample 2030S0004 will be excluded.

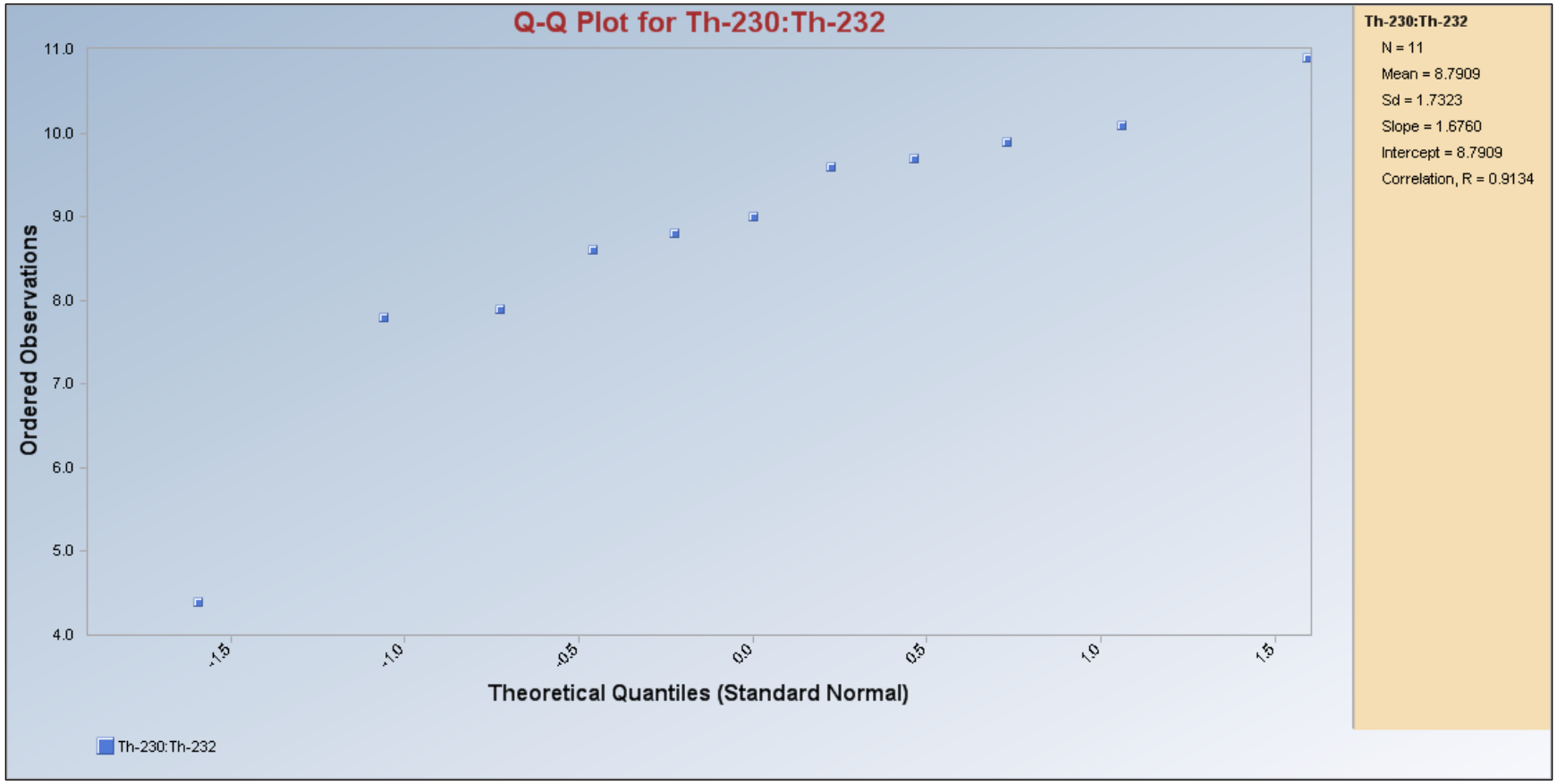

Figure 4-1: Th-230 to Th-232 Ratio Quantile Plot

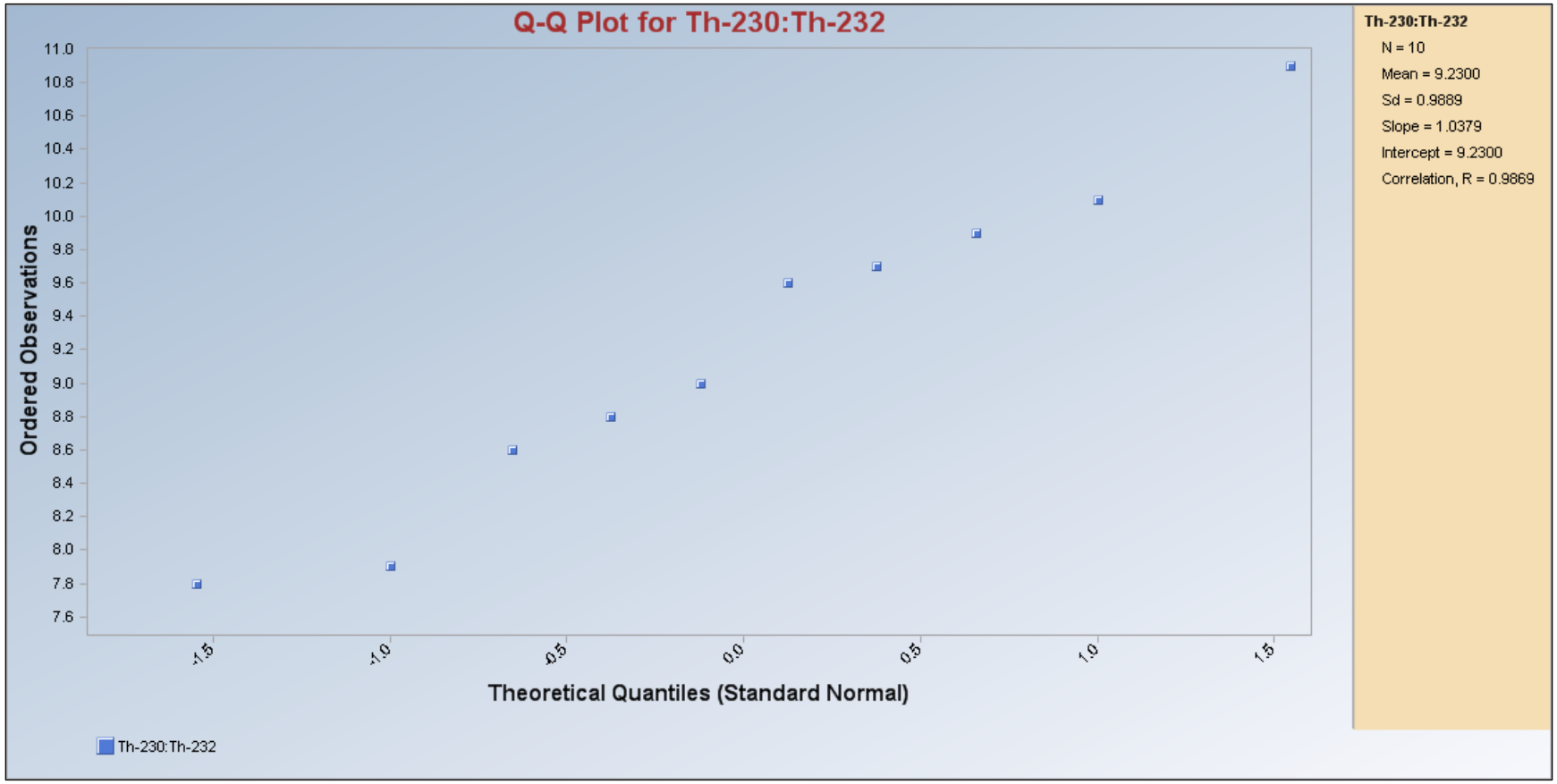

Figure 4-2: Th-230 to Th-232 Ratio Quantile Plot with Outlier Excluded

The $R_{Th\text{-}230:Th\text{-}232}$ data set was analyzed using the Environmental Protection Agency's (EPA) ProUCL v4.00.005 statistical software. Attachment J provides the output from ProUCL showing that the Student's-t 95% upper confidence level (UCL) for this dataset is equal to 9.8.

Using Equation 4-1 and the calculated $R_{Th\text{-}230:Th\text{-}232}$ of 9.8, the modified Th-232 DCGL is calculated to be 4.2 pCi/g and 8.7 pCi/g for Surface and Subsurface, respectively. The NUREG-1507 provided Th-232 scan MDC of 1.8 pCi/g (Table 4-1) and the calculated Th-232 scan MDC of 1.2 pCi/g (Table 4-7) are less than both modified DCGLs and therefore adequate sensitivity has been demonstrated, using the re-evaluated DCGLs with Th-232 accounting for the dose from Th-230. The equations below illustrate the modified Th-232 DCGL calculations.

$$\text{Surface DCGL}_{Th-232_{Mod}} = \frac{1}{\frac{1}{5.0\ \text{pCi/g}} + \frac{9.8}{276.9\ \text{pCi/g}}} = 4.2\ \text{pCi/g}$$

$$\text{Subsurface DCGL}_{Th-232_{Mod}} = \frac{1}{\frac{1}{65.9\ \text{pCi/g}} + \frac{9.8}{97.9\ \text{pCi/g}}} = 8.7\ \text{pCi/g}$$

4.3 ACCOUNTING FOR U-234

Uranium-238 will be used as a surrogate for U-234 using the natural uranium ratio of 1:1. The U-238 DCGL will be modified and the U-238 scan MDC will be compared to the modified U-238 DCGL. Using Equation I-14 of MARSSIM, the modified U-238 DCGL is calculated to be 380.7 pCi/g and 3,583 pCi/g for Surface and Subsurface, respectively. The equations below illustrate the modified U-238 DCGL calculations.

$$\text{Surface DCGL}_{U-238_{Mod}} = \frac{1}{\frac{1}{442.4\ \text{pCi/g}} + \frac{1}{2{,}729\ \text{pCi/g}}} = 380.7\ \text{pCi/g}$$

$$\text{Subsurface DCGL}_{U-238_{Mod}} = \frac{1}{\frac{1}{8{,}658\ \text{pCi/g}} + \frac{1}{6{,}113\ \text{pCi/g}}} = 3{,}583\ \text{pCi/g}$$

4.4 SENSITIVITY OF MULTIPLE RADIONUCLIDES

When multiple radionuclides are present, the effective scan MDC will be greater than the smallest scan MDC but less than the largest scan MDC. The following equation[2] is used to determine the scan MDC for the mixture of multiple radionuclides:

$$\text{Mixture Scan MDC} = \frac{1}{\frac{f_{Th-232}}{\text{scan MDC}_{Th-232}} + \frac{f_{U-238}}{\text{scan MDC}_{U-238}} + \frac{f_{Ra-226}}{\text{scan MDC}_{Ra-226}}} \qquad (4\text{-}2)$$

[2] *Decommissioning Health Physics: A Handbook for MARSSIM Users*, E.W. Abelquist; Equation 9.15.

where f_{Th-232}, f_{U-238}, and f_{Ra-226} are the fractional amounts of each radionuclide and scan MDC_{Th-232}, scan MDC_{U-238}, and scan MDC_{Ra-226} are the individual scan MDCs for each radionuclide.

The activity fractions were calculated using isotopic thorium and isotopic uranium results for the samples used to determine the $R_{Th-230:Th-232}$ as well as Ra-226 data for the same samples analyzed using gamma spectroscopy by ORISE and on-site by Energy*Solutions*. Note that ORISE sample 2030S0004 was excluded from this analysis. The activity fractions were determined to be 0.465, 0.429, and 0.106 for Th-232, U-238, and Ra-226, respectively. Table 4-9 provides the results.

Table 4-9: Calculation of Activity Fractions from Sample Results

Sample ID	Alpha Spec Result (pCi/g)		Gamma Spec Result (pCi/g)
	Th-232	U-238	Ra-226 [a]
ORISE Samples			
2030S0006	5.54	7.13	0.73
2030S0007	2.85	7.77	1.37
2030S0009	7.5	5.63	1.11
2030S0010	59.9	21.3	2.01
EnergySolutions Samples			
SU3FSSB001	7.1	10.2	2.94
SU3FSSB006	9.1	9.2	2.94
SU3CWA4B03	2.85	14.7	6.45
SU3CWA4B07	15.2	18.1	4.43
SU3CWA5B08	11.6	18.7	4.99
SU3CWA7B02	13	11.6	3.75
Total Activity (pCi/g)	134.64	124.33	30.72
Activity Fraction	**0.465**	**0.429**	**0.106**

[a] ORISE results determined via Pb-214 peak and Energy*Solutions* results determined via deconvoluted 186 keV Ra-226 Peak.

The scan MDC for the mixture using Equation 4-2 and the NUREG-1507 provided scan MDCs (Table 4-1) is calculated to be 3.3 pCi/g. Using the calculated scan MDCs (Table 4-7), the mixture scan MDC is calculated to be 2.2 pCi/g. Both calculations are illustrated below.

$$\text{Mixture Scan MDC}_{\text{NUREG-1507 Table 6.4}} = \frac{1}{\frac{0.465}{1.8\ \text{pCi/g}} + \frac{0.429}{80\ \text{pCi/g}} + \frac{0.106}{2.8\ \text{pCi/g}}} = 3.3\ \text{pCi/g}$$

$$\text{Mixture Scan MDC}_{\text{Calculated}} = \frac{1}{\frac{0.465}{1.2\ \text{pCi/g}} + \frac{0.429}{24.6\ \text{pCi/g}} + \frac{0.106}{1.7\ \text{pCi/g}}} = 2.2\ \text{pCi/g}$$

The mixture scan MDC must be compared to a gross activity DCGL in order to determine if there is adequate sensitivity for the mixture. MARSSIM Equation 4-4 is used to calculate the gross activity and is shown in the appropriate form below.

$$\text{Gross Activity DCGL} = \frac{1}{\frac{f_{Th-232}}{DCGL_{Th-232_{mod}}} + \frac{f_{U-238}}{DCGL_{U-238_{mod}}} + \frac{f_{Ra-226}}{DCGL_{Ra-226}}} \quad (4\text{-}3)$$

Using the modified Th-232+C, modified U-238+D, and Ra-226+C DCGLs, the gross activity DCGL was calculated to be 7.8 pCi/g and 18.0 pCi/g for Surface and Subsurface, respectively, as illustrated below.

$$\text{Surface Gross Activity DCGL} = \frac{1}{\frac{0.465}{4.2\ pCi/g} + \frac{0.429}{380.7\ pCi/g} + \frac{0.106}{6.2\ pCi/g}} = 7.8\ pCi/g$$

$$\text{Subsurface Gross Activity DCGL} = \frac{1}{\frac{0.465}{8.7\ pCi/g} + \frac{0.429}{3{,}583\ pCi/g} + \frac{0.106}{51.2\ pCi/g}} = 18.0\ pCi/g$$

Because the mixture scan MDCs (3.3 pCi/g and 2.2 pCi/g) are less than the Surface and Subsurface gross activity DCGLs, adequate sensitivity has been demonstrated for the radionuclide mixture.

A bounding analysis using the NUREG-1507 provided scan MDCs (Table 4-1) and the above methodology was used to determine the maximum value for $R_{Th-230:Th-232}$ where the mixture scan MDC would be less than both the Surface and Subsurface gross activity DCGLs. The result was that $R_{Th-230:Th-232}$ had to be less than or equal to 112 and 61 for Surface and Subsurface, respectively. This demonstrates that there will still be adequate scan sensitivity should there be locations with a significantly greater $R_{Th-230:Th-232}$ than accounted for by the UCL.

5.0 SCAN ACTION LEVELS

Scan action levels were developed using two methodologies: analysis of empirical field data and use of MicroShield® modeling to develop a field efficiency for an elevated area equal in size to the bounded area between FSS samples.

5.1 EMPIRICAL METHOD

Scan action levels were developed using *in situ* NaI 1-minute static measurements, on-site gamma spectroscopy analytical sample results, and sum of fractions (SOF) calculations provided in Attachment K. The cumulative percentage of samples that exceeded an SOF of 1 was plotted versus the gross *in situ* NaI measurement. The scan action level was set at a cumulative frequency of 5% using a linear regression analysis of the data and the results are 18,000 gross counts per minute (cpm) and 38,000 gross cpm for Surface and Subsurface, respectively. Figure 5-1 and Figure 5-2 show the plotted data and linear regression analysis for Surface and Subsurface, respectively.

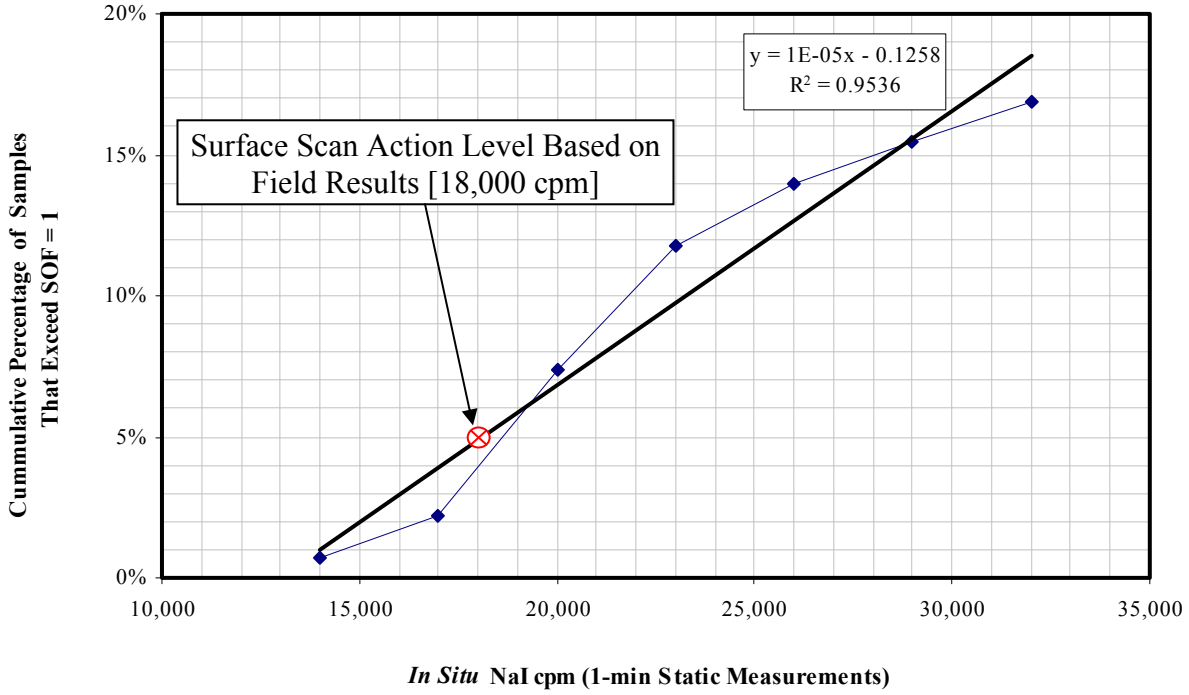

Figure 5-1: Surface Scan Action Level

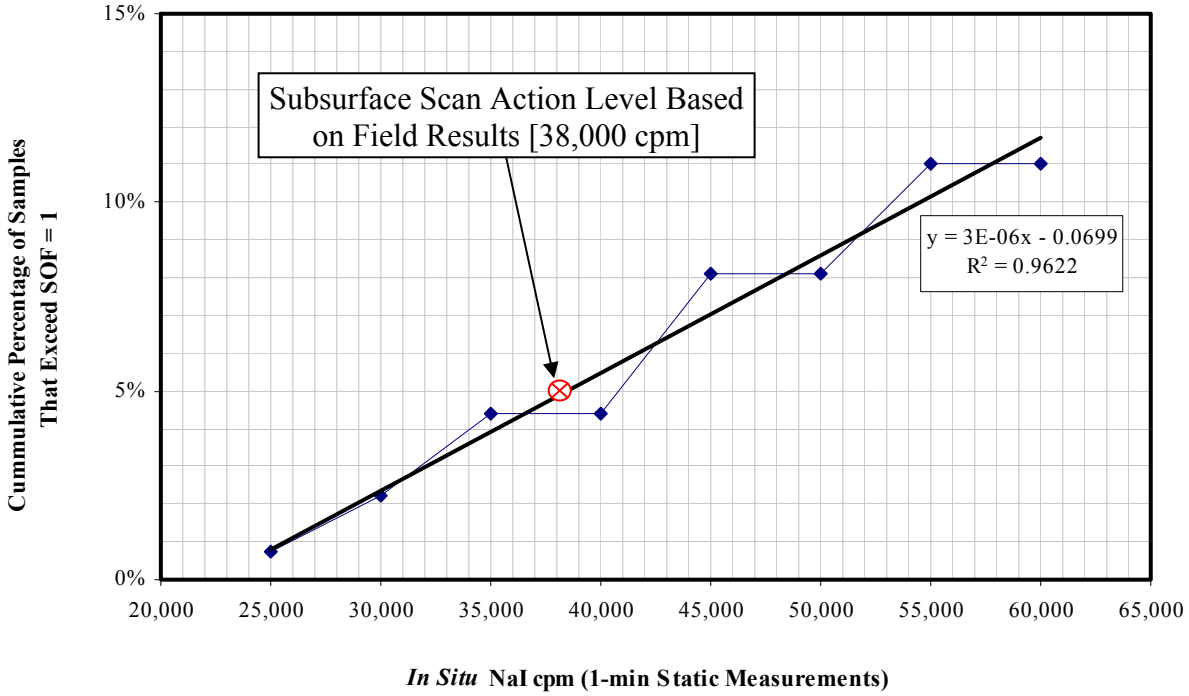

Figure 5-2: Subsurface Scan Action Level

5.2 MICROSHIELD® MODELED FIELD EFFICIENCY METHOD

As an alternate method, a field efficiency was developed for an elevated area equal in size to the bounded area between FSS samples. A draft FSS report has been provided to the NRC[3] for survey unit (SU) 3 and FSS activities are on-going in SU2 as of the date of this report. The FSS design of 12 random-start systematic samples excluded the confirmed waste areas and the total sampled area was 1,450 m^2 and 1,423 m^2 for SU2 and SU3, respectively. The bounded area between FSS samples is simply the total sampled area divided by the number of samples, or 120.8 m^2 and 118.5 m^2 for SU2 and SU3, respectively.

5.2.1 Developing Individual Field Efficiencies

The five MicroShield® models discussed in Section 4.1.2 were used to develop the field efficiency with all inputs the same except that the radius was set to 614 centimeters (cm), which corresponds to the SU3 bounded area of 118.5 m^2. The SU3 bounded area was chosen for modeling the field efficiency as the slightly smaller area provided a slightly conservative (lower) exposure rate. The MicroShield® outputs for each model are provided in Attachment L.

The exposure rate for each given energy (ignoring energies less than or equal to 15 keV) for each model was divided by the source activity input of 5 pC/g to give µR/hr per pCi/g. The µR/hr per pCi/g result was then multiplied by the NUREG-1507 Table 6.3 cpm per µR/hr at that energy to arrive at a field efficiency for that energy in cpm per pCi/g. The cpm per pCi/g results for all energies were summed to calculate the total field efficiency in cpm per pCi/g. The results are presented in Table 5-1, Table 5-2, Table 5-3, Table 5-4, and Table 5-5 for Th-232+C, U-238+D, U-234, Th-230, and Ra-226+C, respectively.

Table 5-1: MicroShield® Results and Calculation of Field Efficiency for Th-232+C

Energy (keV)	Exposure Rate (µR/hr)	µR/hr per pCi/g	cpm per µR/hr	cpm per pCi/g
60	1.585E-03	3.170E-04	13,000	4.121E+00
80	1.599E-01	3.198E-02	12,000	3.838E+02
100	3.572E-02	7.144E-03	9,840	7.030E+01
150	3.387E-02	6.774E-03	6,040	4.091E+01
200	5.783E-01	1.157E-01	4,230	4.892E+02
300	4.052E-01	8.104E-02	2,520	2.042E+02
400	4.726E-02	9.452E-03	1,700	1.607E+01
500	3.486E-01	6.972E-02	1,270	8.854E+01
600	9.714E-01	1.943E-01	1,010	1.962E+02
800	6.906E-01	1.381E-01	710	9.807E+01
1000	2.775E+00	5.550E-01	540	2.997E+02
1500	6.961E-01	1.392E-01	350	4.873E+01
2000	9.364E-03	1.873E-03	260	4.869E-01
3000	4.462E+00	8.924E-01	180	1.606E+02
Total Field Efficiency (cpm per pCi/g Th-232+C):				**2,101**

[3] E-mail correspondence from A. Palmer (Energy*Solutions*) to M. McCann (NRC), Subject: SU-3 FSS Report, December 10, 2010.

Table 5-2: MicroShield® Results and Calculation of Field Efficiency for U-238+D

Energy (keV)	Exposure Rate (µR/hr)	µR/hr per pCi/g	cpm per µR/hr	cpm per pCi/g
60	8.959E-03	1.792E-03	13,000	2.329E+01
80	5.290E-04	1.058E-04	12,000	1.270E+00
100	3.043E-02	6.086E-03	9,840	5.989E+01
800	8.192E-03	1.638E-03	710	1.163E+00
1000	4.694E-02	9.388E-03	540	5.070E+00
Total Field Efficiency (cpm per pCi/g U-238+D):				**90.68**

Table 5-3: MicroShield® Results and Calculation of Field Efficiency for U-234

Energy (keV)	Exposure Rate (µR/hr)	µR/hr per pCi/g	cpm per µR/hr	cpm per pCi/g
50	1.869E-04	3.738E-05	11,800	4.411E-01
100	2.016E-04	4.032E-05	9,840	3.967E-01
Total Field Efficiency (cpm per pCi/g U-234):				**0.8378**

Table 5-4: MicroShield® Results and Calculation of Field Efficiency for Th-230

Energy (keV)	Exposure Rate (µR/hr)	µR/hr per pCi/g	cpm per µR/hr	cpm per pCi/g
60	8.550E-04	1.710E-04	13,000	2.223E+00
150	5.554E-04	1.111E-04	6,040	6.709E-01
Total Field Efficiency (cpm per pCi/g Th-230):				**2.894**

Table 5-5: MicroShield® Results and Calculation of Field Efficiency for Ra-226+C

Energy (keV)	Exposure Rate (µR/hr)	µR/hr per pCi/g	cpm per µR/hr	cpm per pCi/g
50	8.166E-03	1.633E-03	11,800	1.927E+01
80	8.591E-02	1.718E-02	12,000	2.062E+02
100	6.832E-04	1.366E-04	9,840	1.345E+00
200	1.147E-01	2.294E-02	4,230	9.704E+01
300	3.263E-01	6.526E-02	2,520	1.645E+02
400	7.962E-01	1.592E-01	1,700	2.707E+02
500	4.599E-02	9.198E-03	1,270	1.168E+01
600	1.470E+00	2.940E-01	1,010	2.969E+02
800	3.746E-01	7.492E-02	710	5.319E+01
1000	1.526E+00	3.052E-01	540	1.648E+02
1500	1.327E+00	2.654E-01	350	9.289E+01
2000	2.381E+00	4.762E-01	260	1.238E+02
Total Field Efficiency (cpm per pCi/g Ra-226+C):				**1,502**

The following equation illustrates the 60 keV calculation from Table 5-1.

$$\frac{1.585E-03\ \mu R/hr}{5\ pCi/g} \times 13{,}000\ \frac{cpm}{\mu R/hr} = 4.121\ cpm\ per\ pCi/g$$

5.2.2 Developing Mixture Field Efficiency

As discussed in Sections 4.2 and 4.3, the Th-232+C DCGL was modified to account for Th-230 and the U-238+D DCGL was modified to account for U-234. Therefore, the calculated field efficiencies for Th-230 (Table 5-4) and U-234 (Table 5-3) will not be used and are provided for information only.

The activity fractions provided in Table 4-9 were used to weight the Th-232+C, U-238+D, and Ra-226+C individual field efficiencies to determine a mixture field efficiency of 1,175 cpm per pCi/g (gross activity). The calculation is illustrated below.

$$\left(0.465 \times 2{,}101\ \frac{cpm}{pCi/g}\right) + \left(0.429 \times 90.86\ \frac{cpm}{pCi/g}\right) + \left(0.106 \times 1{,}502\ \frac{cpm}{pCi/g}\right) = 1{,}175\ \frac{cpm}{pCi/g}$$

5.2.3 Calculation of Action Level

The gross activity DCGLs were calculated in Section 4.4 to be 7.8 pCi/g and 17.9 pCi/g for Surface and Subsurface, respectively. Using the mixture field efficiency calculated in Section 5.2.2, the gross activity DCGLs are 9,165 cpm and 21,150 cpm (above background). The calculations are illustrated below.

$$\text{Surface Gross Activity DCGL} = 7.8\ pCi/g \times 1{,}175\ \frac{cpm}{pCi/g} = 9{,}165\ cpm$$

$$\text{Subsurface Gross Activity DCGL} = 18.0\ pCi/g \times 1{,}175\ \frac{cpm}{pCi/g} = 21{,}150\ cpm$$

Because the goal of the scan survey is to identify elevated areas that exceed the DCGL, the action levels are therefore equal to the DCGL values in cpm plus the background value of 10,000 cpm. Rounding down to the nearest thousand cpm, the scan action levels equal 19,000 gross cpm and 31,000 gross cpm for Surface and Subsurface, respectively.

5.3 SUMMARY

The scan action level results provided in Sections 5.1 and 5.2 are summarized in Table 5-6, with the final scan action levels indicated.

Table 5-6: Summary of Scan Action Levels

Result	Action Level (gross cpm)	
	Surface	Subsurface
Empirical	18,000	38,000
MicroShield® Model	19,000	31,000
Final	**18,000**	**31,000**

6.0 DEMONSTRATING COMPLIANCE

Once the FSS data are collected, the data for each survey unit will be assessed and evaluated to ensure that it is adequate to support the release of the survey unit. The SOF will be calculated to ensure a value less than 1 to demonstrate compliance with the TEDE criterion. The Elevated Measurement Comparison (EMC) test will be applied to any identified small areas of elevated activity as discussed in MARSSIM.

6.1 UNITY RULE

The unity rule will be used to demonstrate compliance with the TEDE criterion. The unity rule will evaluate the TEDE from Th-232+C and U-238+C using Option 3 discussed above. The unity rule equation is provided below. Note that U-238 is a surrogate for U-234 with a demonstrated 1:1 ratio (secular equilibrium).

$$SOF = \frac{C_{Th-232}}{DCGL_{Th-232+C}} + \frac{C_{U-238}}{DCGL_{U-238+D}} + \frac{C_{U-238}}{DCGL_{U-234}} + \frac{C_{Th-230}}{DCGL_{Th-230}} + \frac{C_{Ra-226}}{DCGL_{Ra-226+C}} \qquad (6\text{-}1)$$

The concentration of Th-232 may serve as a surrogate for Th-230 if Th-230 is not measured during sample analysis. For simplicity, instead of modifying the Th-232+C DCGL, the Th-230 to Th-232 ratio and Th-232 concentration will be inserted into the Th-230 term. The revised Th-230 term is illustrated below.

$$\frac{C_{Th-230}}{DCGL_{Th-230}} = \frac{R_{Th-230:Th-232} \times C_{Th-232}}{DCGL_{Th-230}} \qquad (6\text{-}2)$$

6.2 SMALL AREAS OF ELEVATED ACTIVITY

The EMC will be applied to Class 1 survey units only when an elevated area is identified by surface scans or biased and systematic samples. The EMC provides assurance that unusually large results receive the proper attention and that any area having the potential for significant dose contribution is identified. Locations identified by surface scans or sample analyses which exceed the DCGL are subject to additional surveys to determine compliance with the elevated measurement criteria. Based upon the size of the elevated measurement area, the corresponding AF will be determined from Table 3-6, using linear or exponential interpolation as necessary.

The EMC will be applied by summing the contributing dose fractions of the survey unit through the unity equation. This will be performed by determining the fraction of dose contributed by the average activity across the survey unit and by adding the additional dose contribution from each individual elevated area following the guidance as provided in Sections 8.5.1 and 8.5.2 of MARSSIM.

6.2.1 Average Activity Fraction

The average activity within the survey unit will be determined from the systematic sampling and measurement results, excluding all biased results and any results within an elevated area. This is

to ensure the proper statistical testing of the survey data without skewing the results of the evaluation. Any samples taken within an elevated area including systematic and biased samples used to evaluate the average activity within the elevated area will be excluded from the survey unit average. The average activity fraction, f_{Avg}, will be calculated as follows.

$$f_{Avg} = \sum_{j=1}^{x} \frac{\delta_j}{DCGL_j} \tag{6-3}$$

where: f_{Avg} = Dose contribution from the average survey unit activity;
x = Number of measured contaminants;
δ_j = Survey unit average activity (pCi/g) of contaminant j; and
$DCGL_j$ = Derived Concentration Guideline Level of contaminant j.

6.2.2 Elevated Area Fraction

The additional dose fraction or contribution from each elevated area will be determined by calculating the average activity within the elevated area, subtracting the average activity of the survey unit, and then dividing by the corresponding $DCGL_{EMC}$ which is the product of the DCGL and the AF that applies to the size of the elevated area. The average survey unit activity is subtracted as the dose contribution is already accounted for based upon the average activity contribution to the dose as calculated above. The additional dose contribution from the elevated area(s) is/are a result of any elevated activity in excess of the survey unit average. The elevated area fraction, f_{EMC}, will be calculated as follows:

$$f_{EMC} = \sum_{j=1}^{x} \sum_{i=1}^{y} \frac{\left(\tau_{i,j} - \delta_j\right)}{AF_{i,j} \times DCGL_j} \tag{6-4}$$

where: f_{EMC} = Dose contribution from elevated area(s);
x = Number of measured contaminants;
y = Number of elevated areas;
$\tau_{i,j}$ = Average activity of contaminant j in elevated area i;
δ_j = Survey unit average activity for contaminant j;
$AF_{i,j}$ = AF for contaminant j based upon the size of elevated area i; and
$DCGL_j$ = Derived Concentration Guideline Level of contaminant j.

6.2.3 Sum of Fractions

Once all the dose contributions are determined, the sum of the average activity fraction (Equation 6-3) and the elevated area fraction (Equation 6-4) must be less than or equal to 1.

$$f_{Avg} + f_{EMC} \leq 1 \tag{6-5}$$

If the test fails, additional remediation will be performed as necessary to address the elevated areas. If the other statistical tests pass with the exception of the EMC test, remediation may be

performed within these isolated area(s) only and the immediate area(s) re-surveyed without having to resurvey the entire survey unit as discussed in Section 8.5.3 of MARSSIM.

ATTACHMENT A: RESRAD Summary Report for Surface Th-232+C

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.RAD

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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(2)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(3)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(4)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(5)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(6)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(7)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(8)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(9)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(10)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(1)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(2)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(1)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(2)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(3)
D-34	Food transfer factors:			
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(1,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(1,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(2,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(1,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(1,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(2,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(2,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)

#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.

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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)	3.800E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.160E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-228	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Th-228	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-232	1.000E+00	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06		WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.886E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.529E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.529E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	1.169E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E 01	5.000E 01		FIND
R017	Fraction of time spent outdoors (on site)	1.101E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.190E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.190E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00		STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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     Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g

       Area:   3800.00 square meters                Ra-228     1.000E+00
  Thickness:      0.15 meters                       Th-228     1.000E+00
Cover Depth:      0.00 meters                       Th-232     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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  5.014E+00  4.998E+00  2.624E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
        M(t):  2.006E-01  1.999E-01  1.050E-01  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00

Maximum TDOSE(t):  5.014E+00 mrem/yr   at t = 0.000E+00 years
```

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	2.139E+00	0.4266	5.037E-05	0.0000	0.000E+00	0.0000	2.155E-01	0.0430	1.621E-02	0.0032	2.054E-02	0.0041	2.071E-02	0.0041
Th-228	2.398E+00	0.4783	2.510E-04	0.0001	0.000E+00	0.0000	2.676E-03	0.0005	4.278E-04	0.0001	3.009E-05	0.0000	9.470E-03	0.0019
Th-232	1.230E-01	0.0245	1.423E-03	0.0003	0.000E+00	0.0000	2.321E-02	0.0046	2.526E-03	0.0005	1.263E-03	0.0003	3.935E-02	0.0078
Total	4.661E+00	0.9295	1.724E-03	0.0003	0.000E+00	0.0000	2.414E-01	0.0481	1.917E-02	0.0038	2.183E-02	0.0044	6.953E-02	0.0139

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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.412E+00	0.4811
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.411E+00	0.4809
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.907E-01	0.0380
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.014E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	2.573E+00	0.5149	1.155E-04	0.0000	0.000E+00	0.0000	1.907E-01	0.0382	1.442E-02	0.0029	1.809E-02	0.0036	2.091E-02	0.0042
Th-228	1.664E+00	0.3329	1.735E-04	0.0000	0.000E+00	0.0000	1.850E-03	0.0004	2.957E-04	0.0001	2.080E-05	0.0000	6.545E-03	0.0013
Th-232	4.095E-01	0.0819	1.423E-03	0.0003	0.000E+00	0.0000	4.729E-02	0.0095	4.316E-03	0.0009	3.550E-03	0.0007	4.158E-02	0.0083
Total	4.647E+00	0.9297	1.712E-03	0.0003	0.000E+00	0.0000	2.398E-01	0.0480	1.903E-02	0.0038	2.166E-02	0.0043	6.904E-02	0.0138

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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.818E+00	0.5637
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.673E+00	0.3347
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.076E-01	0.1016
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.998E+00	1.0000

*Sum of all water independent and dependent pathways.

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

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.
Ra-228	1.818E-05	0.0000	7.979E-10	0.0000	0.000E+00	0.0000	4.115E-07	0.0000	3.165E-08	0.0000	3.855E-08	0.0000	6.530E-08	0.0000
Th-228	2.343E-16	0.0000	1.462E-20	0.0000	0.000E+00	0.0000	1.560E-19	0.0000	2.494E-20	0.0000	1.753E-21	0.0000	5.516E-19	0.0000
Th-232	2.512E+00	0.9573	5.458E-04	0.0002	0.000E+00	0.0000	7.656E-02	0.0292	6.081E-03	0.0023	6.916E-03	0.0026	2.201E-02	0.0084
Total	2.512E+00	0.9573	5.458E-04	0.0002	0.000E+00	0.0000	7.656E-02	0.0292	6.081E-03	0.0023	6.917E-03	0.0026	2.201E-02	0.0084

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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.873E-05	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.351E-16	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.624E+00	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.624E+00	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/15/2010 15:19 Page 12
Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 2.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 15:19 Page 13
Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 15:19 Page 14
Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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 = 5.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 5.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 15:19 Page 15
Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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 = 6.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 6.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 15:19 Page 16
Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 7.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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 = 8.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 8.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228+D	Ra-228+D	1.000E+00	1.967E+00	1.738E+00	6.026E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	4.457E-01	1.080E+00	1.271E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228+D	∑DSR(j)		2.412E+00	2.818E+00	1.873E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228+D	Th-228+D	1.000E+00	2.411E+00	1.673E+00	2.351E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	5.233E-02	5.195E-02	1.665E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Ra-228+D	1.000E+00	1.198E-01	3.418E-01	1.083E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Th-228+D	1.000E+00	1.866E-02	1.139E-01	1.525E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	∑DSR(j)		1.907E-01	5.076E-01	2.624E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	1.036E+01	8.872E+00	1.335E+06	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14
Th-228	1.037E+01	1.494E+01	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14
Th-232	1.311E+02	4.925E+01	9.527E+00	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05

*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)
Ra-228	1.000E+00	2.364 ± 0.005	2.975E+00	8.403E+00	2.412E+00	1.036E+01
Th-228	1.000E+00	0.000E+00	2.411E+00	1.037E+01	2.411E+00	1.037E+01
Th 232	1.000E+00	29.21 ± 0.06	4.329E+00	5.774E+00	1.907E 01	1.311E+02

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Summary : Breckenridge Surface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-232+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	Ra-228	1.000E+00	1.967E+00	1.738E+00	6.026E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	1.198E-01	3.418E-01	1.083E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	∑DOSE(j)		2.086E+00	2.080E+00	1.083E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Ra-228	1.000E+00	4.457E-01	1.080E+00	1.271E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-228	1.000E+00	2.411E+00	1.673E+00	2.351E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	1.866E-02	1.139E-01	1.525E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	∑DOSE(j)		2.876E+00	2.867E+00	1.525E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	5.233E-02	5.195E-02	1.665E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	Ra-228	1.000E+00	1.000E+00	8.862E-01	5.651E-06	3.194E-11	1.805E-16	5.765E-27	3.258E-32	1.841E-37	1.041E-42	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	1.135E-01	9.570E-01	9.147E-01	8.742E-01	7.985E-01	7.631E-01	7.293E-01	6.970E-01	6.367E-01
Ra-228	∑S(j):		1.000E+00	9.997E-01	9.570E-01	9.147E-01	8.742E-01	7.985E-01	7.631E-01	7.293E-01	6.970E-01	6.367E-01
Th-228	Ra-228	1.000E+00	0.000E+00	2.852E-01	8.464E-06	4.783E-11	2.703E-16	8.634E-27	4.879E-32	2.757E-37	1.558E-42	0.000E+00
Th-228	Th-228	1.000E+00	1.000E+00	6.957E-01	1.758E-16	3.092E-32	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	1.864E-02	9.570E-01	9.147E-01	8.742E-01	7.985E-01	7.631E-01	7.293E-01	6.970E-01	6.367E-01
Th-228	∑S(j):		1.000E+00	9.996E-01	9.570E-01	9.147E-01	8.742E-01	7.985E-01	7.631E-01	7.293E-01	6.970E-01	6.367E-01
Th-232	Th-232	1.000E+00	1.000E+00	9.995E-01	9.557E-01	9.134E-01	8.730E-01	7.974E-01	7.621E-01	7.283E-01	6.961E-01	6.358E-01

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

RESCALC.EXE execution time = 1.45 seconds

ATTACHMENT B: RESRAD Summary Report for Surface U-238+C

RESRAD, Version 6.4 T½ Limit = 180 days 11/15/2010 15:24 Page 1
Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.RAD

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Time = 2.000E+02 13
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Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(4)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(7)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(8)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(9)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(10)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(11)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(12)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(13)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(14)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(15)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(16)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(3)
B-1	U-234	1.320E-01	1.320E-01	DCF2(4)
B-1	U-238	1.180E-01	1.180E-01	DCF2(5)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(6)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(3)
D-1	U-234	2.830E-04	2.830E-04	DCF3(4)
D-1	U-238	2.550E-04	2.550E-04	DCF3(5)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(6)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D 34	Pb 210+D , beef/livestock intake ratio, (pCi/kg)/(pCi/d)	8.000E 04	8.000E 04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D-34				

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Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(4,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(4,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(5,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(5,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(4,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(4,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(5,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(5,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)

#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.

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Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.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)	3.800E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.160E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(5)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): U-238	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)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E 01	1.000E+00		PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ

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Summary : Breckenridge Surface U-238+C
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.774E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.886E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.529E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.600E+03	5.000E+01		DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.641E-03	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.641E-03	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	1.169E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.101E-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)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01		SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.190E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.190E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5

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R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	3800.00 square meters	Pb-210	1.000E+00
Thickness:	0.15 meters	Ra-226	1.000E+00
Cover Depth:	0.00 meters	Th-230	1.000E+00
		U-234	1.000E+00
		U-238	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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
TDOSE(t):	4.096E+00	4.080E+00	2.066E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
M(t):	1.638E-01	1.632E-01	8.263E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Maximum TDOSE(t): 4.096E+00 mrem/yr at t = 0.000E+00 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.080E-03	0.0005	1.974E-05	0.0000	0.000E+00	0.0000	2.813E-01	0.0687	4.328E-02	0.0106	2.211E-02	0.0054	9.980E-02	0.0244
Ra-226	3.300E+00	0.8058	7.753E-06	0.0000	0.000E+00	0.0000	2.130E-01	0.0520	1.635E-02	0.0040	2.033E-02	0.0050	1.999E-02	0.0049
Th-230	1.138E-03	0.0003	2.824E-04	0.0001	0.000E+00	0.0000	2.205E-03	0.0005	3.484E-04	0.0001	2.828E-05	0.0000	7.654E-03	0.0019
U-234	1.423E-04	0.0000	1.143E-04	0.0000	0.000E+00	0.0000	2.785E-03	0.0007	6.266E-04	0.0002	1.546E-03	0.0004	3.948E-03	0.0010
U-238	4.795E-02	0.0117	1.022E-04	0.0000	0.000E+00	0.0000	2.644E-03	0.0006	5.950E-04	0.0001	1.468E-03	0.0004	3.749E-03	0.0009
Total	3.352E+00	0.8183	5.264E-04	0.0001	0.000E+00	0.0000	5.020E-01	0.1226	6.119E-02	0.0149	4.549E-02	0.0111	1.351E-01	0.0330

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.486E-01	0.1095
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.570E+00	0.8716
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.166E-02	0.0028
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.162E-03	0.0022
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.650E-02	0.0138
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.096E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.006E-03	0.0005	1.892E-05	0.0000	0.000E+00	0.0000	2.696E-01	0.0661	4.148E-02	0.0102	2.119E-02	0.0052	9.564E-02	0.0234
Ra-226	3.290E+00	0.8064	8.294E-06	0.0000	0.000E+00	0.0000	2.201E-01	0.0539	1.756E-02	0.0043	2.086E-02	0.0051	2.287E-02	0.0056
Th-230	2.561E-03	0.0006	2.804E-04	0.0001	0.000E+00	0.0000	2.282E-03	0.0006	3.532E-04	0.0001	3.691E-05	0.0000	7.608E-03	0.0019
U-234	1.421E-04	0.0000	1.133E-04	0.0000	0.000E+00	0.0000	2.762E-03	0.0007	6.214E-04	0.0002	1.533E-03	0.0004	3.915E-03	0.0010
U-238	4.778E-02	0.0117	1.014E-04	0.0000	0.000E+00	0.0000	2.622E-03	0.0006	5.901E-04	0.0001	1.456E-03	0.0004	3.718E-03	0.0009
Total	3.342E+00	0.8193	5.223E-04	0.0001	0.000E+00	0.0000	4.974E-01	0.1219	6.061E-02	0.0149	4.508E-02	0.0110	1.338E-01	0.0328

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.300E-01	0.1054
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.571E+00	0.8754
Th-230	0.000E+00	0.0000	0.000E+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-02	0.0032
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.087E-03	0.0022
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.627E-02	0.0138
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.080E+00	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

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.
Pb-210	4.675E-05	0.0000	1.812E-07	0.0000	0.000E+00	0.0000	2.583E-03	0.0013	3.976E-04	0.0002	2.030E-04	0.0001	9.159E-04	0.0004
Ra-226	1.742E+00	0.8432	7.609E-06	0.0000	0.000E+00	0.0000	1.401E-01	0.0678	1.651E-02	0.0080	1.212E-02	0.0059	3.255E-02	0.0158
Th-230	7.713E-02	0.0373	8.957E-05	0.0000	0.000E+00	0.0000	6.011E-03	0.0029	7.061E-04	0.0003	4.751E-04	0.0002	3.552E-03	0.0017
U-234	1.343E-04	0.0001	3.218E-05	0.0000	0.000E+00	0.0000	7.853E-04	0.0004	1.765E-04	0.0001	4.345E-04	0.0002	1.112E-03	0.0005
U-238	2.550E-02	0.0123	2.873E-05	0.0000	0.000E+00	0.0000	7.435E-04	0.0004	1.674E-04	0.0001	4.126E-04	0.0002	1.054E-03	0.0005
Total	1.845E+00	0.8929	1.583E-04	0.0001	0.000E+00	0.0000	1.502E-01	0.0727	1.795E-02	0.0087	1.364E-02	0.0066	3.918E-02	0.0190

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.147E-03	0.0020
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.943E+00	0.9406
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.797E-02	0.0426
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.674E-03	0.0013
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.791E-02	0.0135
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	2.066E+00	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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 = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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 = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	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.

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Summary : Breckenridge Surface U-238+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		3.570E+00	3.571E+00	1.943E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.089E-02	1.081E-02	3.628E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Ra-226+D	1.000E+00	7.675E-04	2.302E-03	8.033E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Pb-210+D	1.000E+00	1.226E-06	7.684E-06	4.014E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DSR(j)		1.166E-02	1.312E-02	8.797E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	9.162E-03	9.087E-03	2.635E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	5.023E-08	1.473E-07	3.095E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	2.295E-09	1.608E-08	3.509E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Pb-210+D	1.000E+00	2.887E-12	3.850E-11	1.434E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	∑DSR(j)		9.162E-03	9.087E-03	2.674E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	5.400E-05	4.409E-07	4.372E-07	1.250E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	U-238+D	9.999E-01	5.650E-02	5.627E-02	2.791E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	U-234	9.999E-01	1.297E-08	3.862E-08	7.507E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	4.824E-14	3.276E-13	4.323E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	1.622E-15	2.438E-14	3.274E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Pb-210+D	9.999E-01	1.698E-18	4.655E-17	1.137E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	∑DSR(j)		5.650E-02	5.627E-02	2.791E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	5.573E+01	5.815E+01	6.029E+03	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	7.003E+00	7.000E+00	1.287E+01	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11
Th 230	2.145E+03	1.905E+03	2.842E+02	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10
U-234	2.729E+03	2.751E+03	9.348E+03	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09
U-238	4.424E+02	4.443E+02	8.958E+02	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

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Summary : Breckenridge Surface U-238+C
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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)
Pb-210	1.000E+00	0.000E+00	4.486E-01	5.573E+01	4.486E-01	5.573E+01
Ra-226	1.000E+00	2.050 ± 0.004	3.572E+00	7.000E+00	3.570E+00	7.003E+00
Th-230	1.000E+00	87.7 ± 0.2	9.030E-02	2.769E+02	1.166E-02	2.145E+03
U-234	1.000E+00	0.000E+00	9.162E-03	2.729E+03	9.162E-03	2.729E+03
U-238	1.000E+00	0.000E+00	5.650E-02	4.424E+02	5.650E-02	4.424E+02

RESRAD, Version 6.4 T½ Limit = 180 days 11/15/2010 15:24 Page 22
Summary : Breckenridge Surface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE U-238+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Th-230	1.000E+00	1.226E-06	7.684E-06	4.014E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	U-234	1.000E+00	2.887E-12	3.850E-11	1.434E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	1.698E-18	4.655E-17	1.137E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		4.566E-01	4.516E-01	1.302E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Ra-226	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Th-230	1.000E+00	7.675E-04	2.302E-03	8.033E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	U-234	1.000E+00	2.295E-09	1.608E-08	3.509E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	U-238	9.999E-01	1.622E-15	2.438E-14	3.274E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	∑DOSE(j)		3.563E+00	3.552E+00	1.901E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.089E-02	1.081E-02	3.628E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	5.023E-08	1.473E-07	3.095E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	4.824E-14	3.276E-13	4.323E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		1.089E-02	1.081E-02	3.631E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	9.162E-03	9.087E-03	2.635E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	1.297E-08	3.862E-08	7.507E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	∑DOSE(j)		9.162E-03	9.087E-03	2.635E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	5.400E-05	4.409E-07	4.372E-07	1.250E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	5.650E-02	5.627E-02	2.791E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	∑DOSE(j)		5.650E-02	5.627E-02	2.791E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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

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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.648E-01	2.772E-02	7.683E-04	2.129E-05	1.636E-08	4.535E-10	1.257E-11	3.484E-13	2.676E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	3.052E-02	7.985E-01	7.651E-01	7.124E-01	6.166E-01	5.737E-01	5.337E-01	4.966E-01	4.298E-01
Pb-210	Th-230	1.000E+00	0.000E+00	6.650E-06	2.608E-02	5.824E-02	8.687E-02	1.340E-01	1.532E-01	1.697E-01	1.838E-01	2.058E-01
Pb-210	U-234	1.000E+00	0.000E+00	2.001E-11	9.263E-06	4.344E-05	9.765E-05	2.433E-04	3.261E-04	4.110E-04	4.957E-04	6.576E-04
Pb-210	U-238	9.999E-01	0.000E+00	1.420E-17	7.298E-10	7.122E-09	2.431E-08	1.004E-07	1.598E-07	2.323E-07	3.159E-07	5.089E-07
Pb-210	∑S(j):		1.000E+00	9.953E-01	8.523E-01	8.241E-01	7.994E-01	7.509E-01	7.272E-01	7.038E-01	6.809E-01	6.363E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.993E-01	9.304E-01	8.656E-01	8.053E-01	6.970E-01	6.485E-01	6.033E-01	5.613E-01	4.858E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.330E-04	4.083E-02	7.698E-02	1.088E-01	1.612E-01	1.824E-01	2.007E-01	2.162E-01	2.404E-01
Ra-226	U-234	1.000E+00	0.000E+00	1.948E-09	1.775E-05	6.468E-05	1.326E-04	3.067E-04	4.033E-04	5.015E-04	5.989E-04	7.834E-04
Ra-226	U-238	9.999E-01	0.000E+00	1.840E-15	1.648E-09	1.180E-08	3.567E-08	1.327E-07	2.057E-07	2.931E-07	3.930E-07	6.202E-07
Ra-226	∑S(j):		1.000E+00	9.997E-01	9.712E-01	9.426E-01	9.143E-01	8.586E-01	8.313E-01	8.045E-01	7.782E-01	7.270E-01
Th-230	Th-230	1.000E+00	1.000E+00	9.995E-01	9.549E-01	9.118E-01	8.706E-01	7.938E-01	7.580E-01	7.238E-01	6.911E-01	6.301E-01
Th-230	U-234	1.000E+00	0.000E+00	8.992E-06	8.107E-04	1.462E-03	1.979E-03	2.697E-03	2.932E-03	3.102E-03	3.218E-03	3.327E-03
Th-230	U-238	9.999E-01	0.000E+00	1.274E-11	1.127E-07	3.982E-07	7.922E-07	1.725E-06	2.202E-06	2.659E-06	3.084E-06	3.810E-06
Th-230	∑S(j):		1.000E+00	9.995E-01	9.557E-01	9.132E-01	8.726E-01	7.965E-01	7.609E-01	7.269E-01	6.943E-01	6.334E-01
U-234	U-234	1.000E+00	1.000E+00	9.984E-01	8.484E-01	7.197E-01	6.106E-01	4.395E-01	3.728E-01	3.163E-01	2.684E-01	1.931E-01
U-234	U-238	9.999E-01	0.000E+00	2.830E-06	2.405E-04	4.082E-04	5.195E-04	6.234E-04	6.347E-04	6.283E-04	6.093E-04	5.483E-04
U-234	∑S(j):		1.000E+00	9.984E-01	8.486E-01	7.202E-01	6.111E-01	4.401E-01	3.735E-01	3.169E-01	2.690E-01	1.937E-01
U-238	U-238	5.400E-05	5.400E-05	5.391E-05	4.583E-05	3.889E-05	3.300E-05	2.377E-05	2.017E-05	1.712E-05	1.452E-05	1.046E-05
U-238	U-238	9.999E-01	9.999E-01	9.983E-01	8.486E-01	7.201E-01	6.111E-01	4.401E-01	3.735E-01	3.169E-01	2.690E-01	1.937E-01
U-238	∑S(j):		1.000E+00	9.984E-01	8.486E-01	7.202E-01	6.111E-01	4.401E-01	3.735E-01	3.169E-01	2.690E-01	1.937E-01

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

RESCALC.EXE execution time = 1.70 seconds

ATTACHMENT C: RESRAD Summary Report for Surface Th-230+C

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Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.RAD

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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(11)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(12)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(3)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D 5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)

#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.

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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)	3.800E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.160E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06		WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.774E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.886E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.529E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	1.169E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E-01	5.000E-01		FIND
R017	Fraction of time spent outdoors (on site)	1.101E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.190E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.190E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00		STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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     Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g

       Area:   3800.00 square meters                Pb-210     1.000E+00
  Thickness:      0.15 meters                       Ra-226     1.000E+00
Cover Depth:      0.00 meters                       Th-230     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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  4.030E+00  4.014E+00  2.035E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
        M(t):  1.612E-01  1.606E-01  8.140E-02  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00

Maximum TDOSE(t):  4.030E+00 mrem/yr   at t = 0.000E+00 years
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.080E-03	0.0005	1.974E-05	0.0000	0.000E+00	0.0000	2.813E-01	0.0698	4.328E-02	0.0107	2.211E-02	0.0055	9.980E-02	0.0248
Ra-226	3.300E+00	0.8189	7.753E-06	0.0000	0.000E+00	0.0000	2.130E-01	0.0529	1.635E-02	0.0041	2.033E-02	0.0050	1.999E-02	0.0050
Th-230	1.138E-03	0.0003	2.824E-04	0.0001	0.000E+00	0.0000	2.205E-03	0.0005	3.484E-04	0.0001	2.828E-05	0.0000	7.654E-03	0.0019
Total	3.304E+00	0.8197	3.099E-04	0.0001	0.000E+00	0.0000	4.965E-01	0.1232	5.997E-02	0.0149	4.247E-02	0.0105	1.274E-01	0.0316

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.486E-01	0.1113
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.570E+00	0.8858
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.166E-02	0.0029
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.030E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.006E-03	0.0005	1.892E-05	0.0000	0.000E+00	0.0000	2.696E-01	0.0672	4.148E-02	0.0103	2.119E-02	0.0053	9.564E-02	0.0238
Ra-226	3.290E+00	0.8195	8.294E-06	0.0000	0.000E+00	0.0000	2.201E-01	0.0548	1.756E-02	0.0044	2.086E-02	0.0052	2.287E-02	0.0057
Th-230	2.561E-03	0.0006	2.804E-04	0.0001	0.000E+00	0.0000	2.282E-03	0.0006	3.532E-04	0.0001	3.691E-05	0.0000	7.608E-03	0.0019
Total	3.294E+00	0.8207	3.076E-04	0.0001	0.000E+00	0.0000	4.920E-01	0.1226	5.939E-02	0.0148	4.209E-02	0.0105	1.261E-01	0.0314

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.300E-01	0.1071
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.571E+00	0.8896
Th-230	0.000E+00	0.0000	0.000E+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-02	0.0033
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.014E+00	1.0000

*Sum of all water independent and dependent pathways.

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

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.
Pb-210	4.675E-05	0.0000	1.812E-07	0.0000	0.000E+00	0.0000	2.583E-03	0.0013	3.976E-04	0.0002	2.030E-04	0.0001	9.159E-04	0.0005
Ra-226	1.742E+00	0.8558	7.609E-06	0.0000	0.000E+00	0.0000	1.401E-01	0.0688	1.651E-02	0.0081	1.212E-02	0.0060	3.255E-02	0.0160
Th-230	7.713E-02	0.0379	8.957E-05	0.0000	0.000E+00	0.0000	6.011E-03	0.0030	7.061E-04	0.0003	4.751E-04	0.0002	3.552E-03	0.0017
Total	1.819E+00	0.8938	9.736E-05	0.0000	0.000E+00	0.0000	1.487E-01	0.0731	1.761E-02	0.0087	1.280E-02	0.0063	3.701E-02	0.0182

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.147E-03	0.0020
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.943E+00	0.9547
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.797E-02	0.0432
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	2.035E+00	1.0000

*Sum of all water independent and dependent pathways.

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 13
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 14
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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 = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 15
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 16
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 17
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 18
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 6.4 T½ Limit = 180 days 11/15/2010 16:06 Page 19
Summary : Breckenridge Surface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE TH-230+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		3.570E+00	3.571E+00	1.943E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.089E-02	1.081E-02	3.628E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Ra-226+D	1.000E+00	7.675E-04	2.302E-03	8.033E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Pb-210+D	1.000E+00	1.226E-06	7.684E-06	4.014E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DSR(j)		1.166E-02	1.312E-02	8.797E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	5.573E+01	5.815E+01	6.029E+03	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	7.003E+00	7.000E+00	1.287E+01	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11
Th-230	2.145E+03	1.905E+03	2.842E+02	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10	*2.018E+10

*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)
Pb-210	1.000E+00	0.000E+00	4.486E-01	5.573E+01	4.486E-01	5.573E+01
Ra-226	1.000E+00	2.050 ± 0.004	3.572E+00	7.000E+00	3.570E+00	7.003E+00
Th 230	1.000E+00	87.7 ± 0.2	9.030E 02	2.769E+02	1.166E 02	2.145E+03

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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Th-230	1.000E+00	1.226E-06	7.684E-06	4.014E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		4.566E-01	4.516E-01	1.301E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Ra-226	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Th-230	1.000E+00	7.675E-04	2.302E-03	8.033E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	∑DOSE(j)		3.563E+00	3.552E+00	1.901E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	1.089E-02	1.081E-02	3.628E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.648E-01	2.772E-02	7.683E-04	2.129E-05	1.636E-08	4.535E-10	1.257E-11	3.484E-13	2.676E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	3.052E-02	7.985E-01	7.651E-01	7.124E-01	6.166E-01	5.737E-01	5.337E-01	4.966E-01	4.298E-01
Pb-210	Th-230	1.000E+00	0.000E+00	6.650E-06	2.608E-02	5.824E-02	8.687E-02	1.340E-01	1.532E-01	1.697E-01	1.838E-01	2.058E-01
Pb-210	∑S(j):		1.000E+00	9.953E-01	8.523E-01	8.241E-01	7.993E-01	7.507E-01	7.269E-01	7.034E-01	6.804E-01	6.356E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.993E-01	9.304E-01	8.656E-01	8.053E-01	6.970E-01	6.485E-01	6.033E-01	5.613E-01	4.858E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.330E-04	4.083E-02	7.698E-02	1.088E-01	1.612E-01	1.824E-01	2.007E-01	2.162E-01	2.404E-01
Ra-226	∑S(j):		1.000E+00	9.997E-01	9.712E-01	9.425E-01	9.141E-01	8.583E-01	8.309E-01	8.040E-01	7.776E-01	7.262E-01
Th-230	Th-230	1.000E+00	1.000E+00	9.995E-01	9.549E-01	9.118E-01	8.706E-01	7.938E-01	7.580E-01	7.238E-01	6.911E-01	6.301E-01

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

RESCALC.EXE execution time = 1.46 seconds

ATTACHMENT D: RESRAD Summary Report for Surface Ra-226+C

RESRAD, Version 6.4 T½ Limit = 180 days 11/15/2010 16:14 Page 1
Summary : Breckenridge Surface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE RA-226+C.RAD

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Summary : Breckenridge Surface Ra-226+C
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#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.

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Summary : Breckenridge Surface Ra-226+C
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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)	3.800E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.500E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.160E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
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)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.774E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.886E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.169E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.101E-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)

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Summary : Breckenridge Surface Ra-226+C
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.190E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.190E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E 01	9.000E 01		DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	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	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

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Site-Specific Parameter Summary (continued)

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

Summary of Pathway Selections

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

```
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     Contaminated Zone Dimensions            Initial Soil Concentrations, pCi/g

       Area:   3800.00 square meters                Pb-210     1.000E+00
  Thickness:      0.15 meters                       Ra-226     1.000E+00
Cover Depth:      0.00 meters


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

   t (years):  0.000E+00  1.000E+00  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  4.019E+00  4.001E+00  1.947E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
        M(t):  1.607E-01  1.600E-01  7.789E-02  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00

Maximum TDOSE(t):  4.019E+00 mrem/yr   at t = 0.000E+00 years
```

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.080E-03	0.0005	1.974E-05	0.0000	0.000E+00	0.0000	2.813E-01	0.0700	4.328E-02	0.0108	2.211E-02	0.0055	9.980E-02	0.0248
Ra-226	3.300E+00	0.8213	7.753E-06	0.0000	0.000E+00	0.0000	2.130E-01	0.0530	1.635E-02	0.0041	2.033E-02	0.0051	1.999E-02	0.0050
Total	3.302E+00	0.8218	2.750E-05	0.0000	0.000E+00	0.0000	4.943E-01	0.1230	5.962E-02	0.0148	4.244E-02	0.0106	1.198E-01	0.0298

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.486E-01	0.1116
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.570E+00	0.8884
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.019E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.006E-03	0.0005	1.892E-05	0.0000	0.000E+00	0.0000	2.696E-01	0.0674	4.148E-02	0.0104	2.119E-02	0.0053	9.564E-02	0.0239
Ra-226	3.290E+00	0.8222	8.294E-06	0.0000	0.000E+00	0.0000	2.201E-01	0.0550	1.756E-02	0.0044	2.086E-02	0.0052	2.287E-02	0.0057
Total	3.292E+00	0.8227	2.722E-05	0.0000	0.000E+00	0.0000	4.897E-01	0.1224	5.904E-02	0.0148	4.205E-02	0.0105	1.185E-01	0.0296

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.300E-01	0.1075
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.571E+00	0.8925
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.001E+00	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

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.
Pb-210	4.675E-05	0.0000	1.812E-07	0.0000	0.000E+00	0.0000	2.583E-03	0.0013	3.976E-04	0.0002	2.030E-04	0.0001	9.159E-04	0.0005
Ra-226	1.742E+00	0.8945	7.609E-06	0.0000	0.000E+00	0.0000	1.401E-01	0.0720	1.651E-02	0.0085	1.212E-02	0.0062	3.255E-02	0.0167
Total	1.742E+00	0.8945	7.790E-06	0.0000	0.000E+00	0.0000	1.427E-01	0.0733	1.690E-02	0.0087	1.232E-02	0.0063	3.346E-02	0.0172

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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.147E-03	0.0021
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.943E+00	0.9979
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	1.947E+00	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SURFACE RA-226+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+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.

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Summary : Breckenridge Surface Ra-226+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		3.570E+00	3.571E+00	1.943E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	5.573E+01	5.815E+01	6.029E+03	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	7.003E+00	7.000E+00	1.287E+01	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11	*9.885E+11

*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)
Pb-210	1.000E+00	0.000E+00	4.486E-01	5.573E+01	4.486E-01	5.573E+01
Ra-226	1.000E+00	2.050 ± 0.004	3.572E+00	7.000E+00	3.570E+00	7.003E+00

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Summary : Breckenridge Surface Ra-226+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	4.486E-01	4.300E-01	4.147E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	7.978E-03	2.169E-02	1.220E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		4.566E-01	4.516E-01	1.261E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Ra-226	1.000E+00	3.562E+00	3.550E+00	1.821E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.648E-01	2.772E-02	7.683E-04	2.129E-05	1.636E-08	4.535E-10	1.257E-11	3.484E-13	2.676E-16
Pb-210	Ra-226	1.000E+00	0.000E+00	3.052E-02	7.985E-01	7.651E-01	7.124E-01	6.166E-01	5.737E-01	5.337E-01	4.966E-01	4.298E-01
Pb-210	∑S(j):		1.000E+00	9.953E-01	8.263E-01	7.658E-01	7.124E-01	6.166E-01	5.737E-01	5.337E-01	4.966E-01	4.298E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.993E-01	9.304E-01	8.656E-01	8.053E-01	6.970E-01	6.485E-01	6.033E-01	5.613E-01	4.858E-01

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

RESCALC.EXE execution time = 1.41 seconds

ATTACHMENT E: RESRAD Summary Report for Subsurface Th-232+C

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.RAD

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Time = 1.000E+00 10
Time = 1.000E+02 11
Time = 2.000E+02 12
Time = 3.000E+02 13
Time = 5.000E+02 14
Time = 6.000E+02 15
Time = 7.000E+02 16
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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(2)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(3)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(4)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(5)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(6)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(7)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(8)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(9)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(10)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(1)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(2)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(1)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(2)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(3)
D-34	Food transfer factors:			
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(1,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(1,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(2,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(1,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(1,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(2,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(2,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)

#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.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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)	6.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.450E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-228	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Th-228	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-232	1.000E+00	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	1.500E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06		WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.216E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.132E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.132E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	8.600E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E 01	5.000E 01		FIND
R017	Fraction of time spent outdoors (on site)	1.101E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.300E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.300E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.300E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	0.000E+00	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00		STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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

       Area:    600.00 square meters                Ra-228     1.000E+00
  Thickness:      0.60 meters                       Th-228     1.000E+00
Cover Depth:      1.50 meters                       Th-232     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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  1.960E-06  1.978E-06  5.003E-06  1.278E-05  3.270E-05  2.155E-04  9.837E-04  9.308E-02  1.846E-01  3.793E-01
        M(t):  7.839E-08  7.913E-08  2.001E-07  5.112E-07  1.308E-06  8.620E-06  3.935E-05  3.723E-03  7.382E-03  1.517E-02

Maximum TDOSE(t):  3.793E-01 mrem/yr   at t = 1.000E+03 years
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	3.160E-07	0.1612	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.630E-06	0.8319	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.352E-08	0.0069	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.960E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.160E-07	0.1612
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.630E-06	0.8319
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.352E-08	0.0069
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	1.960E-06	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	7.523E-07	0.3803	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.145E-06	0.5790	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	8.055E-08	0.0407	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.978E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.523E-07	0.3803
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.145E-06	0.5790
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.055E-08	0.0407
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	1.978E-06	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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.
Ra-228	4.108E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	7.633E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	5.003E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.003E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.108E-11	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.633E-22	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.003E-06	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.003E-06	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Ra-228	6.122E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.278E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.278E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.122E-16	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-05	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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.
Ra-228	9.134E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.270E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.270E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.134E-21	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.270E-05	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.270E-05	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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 = 5.000E+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.
Ra-228	1.995E-30	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.155E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.155E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.995E-30	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.155E-04	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.155E-04	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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 = 6.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	5.559E-04	0.5651	0.000E+00	0.0000	0.000E+00	0.0000	4.216E-04	0.4286	2.681E-06	0.0027	3.426E-06	0.0035	0.000E+00	0.0000
Total	5.559E-04	0.5651	0.000E+00	0.0000	0.000E+00	0.0000	4.216E-04	0.4286	2.681E-06	0.0027	3.426E-06	0.0035	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 = 6.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.837E-04	1.0000
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	9.837E-04	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.441E-03	0.0155	0.000E+00	0.0000	0.000E+00	0.0000	8.996E-02	0.9665	7.879E-04	0.0085	8.901E-04	0.0096	0.000E+00	0.0000
Total	1.441E-03	0.0155	0.000E+00	0.0000	0.000E+00	0.0000	8.996E-02	0.9665	7.879E-04	0.0085	8.901E-04	0.0096	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 = 7.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.308E-02	1.0000
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	9.308E-02	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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 = 8.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.758E-03	0.0204	0.000E+00	0.0000	0.000E+00	0.0000	1.775E-01	0.9617	1.556E-03	0.0084	1.757E-03	0.0095	0.000E+00	0.0000
Total	3.758E-03	0.0204	0.000E+00	0.0000	0.000E+00	0.0000	1.775E-01	0.9617	1.556E-03	0.0084	1.757E-03	0.0095	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 = 8.000E+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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.846E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.846E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-232+C.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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.624E-02	0.0692	0.000E+00	0.0000	0.000E+00	0.0000	3.466E-01	0.9138	3.039E-03	0.0080	3.432E-03	0.0090	0.000E+00	0.0000
Total	2.624E-02	0.0692	0.000E+00	0.0000	0.000E+00	0.0000	3.466E-01	0.9138	3.039E-03	0.0080	3.432E-03	0.0090	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.
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.793E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.793E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-232+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228+D	Ra-228+D	1.000E+00	1.490E-08	1.337E-08	2.988E-13	5.993E-18	1.202E-22	4.835E-32	1.569E-35	1.885E-38	2.158E-43	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	3.011E-07	7.389E-07	4.078E-11	6.063E-16	9.014E-21	1.995E-30	3.010E-35	9.598E-40	7.006E-45	0.000E+00
Ra-228+D	∑DSR(j)		3.160E-07	7.523E-07	4.108E-11	6.122E-16	9.134E-21	2.043E-30	4.579E-35	1.981E-38	2.228E-43	0.000E+00
Th-228+D	Th-228+D	1.000E+00	1.630E-06	1.145E-06	7.633E-22	3.575E-37	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Th-232	1.000E+00	7.614E-25	7.854E-25	1.705E-23	3.817E-22	8.547E-21	4.285E-18	1.876E-05	4.004E-03	7.899E-03	1.543E-02
Th-232	Ra-228+D	1.000E+00	9.179E-10	2.642E-09	5.432E-08	1.865E-07	6.405E-07	7.553E-06	4.266E-04	8.595E-02	1.697E-01	3.344E-01
Th-232	Th-228+D	1.000E+00	1.260E-08	7.791E-08	4.948E-06	1.259E-05	3.206E-05	2.079E-04	5.383E-04	3.127E-03	6.954E-03	2.948E-02
Th-232	∑DSR(j)		1.352E-08	8.055E-08	5.003E-06	1.278E-05	3.270E-05	2.155E-04	9.837E-04	9.308E-02	1.846E-01	3.793E-01

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	7.912E+07	3.323E+07	6.085E+11	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14
Th-228	1.533E+07	2.183E+07	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	2.541E+04	2.686E+02	1.355E+02	6.590E+01

*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 = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-228	1.000E+00	4.276 ± 0.009	1.175E-06	2.127E+07	0.000E+00	*2.726E+14
Th-228	1.000E+00	0.000E+00	1.630E-06	1.533E+07	0.000E+00	*8.195E+14
Th 232	1.000E¦00	1.000E¦03	3.793E 01	6.590E¦01	3.793E 01	6.590E¦01

*At specific activity limit

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Summary : Breckenridge Subsurface Th-232+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	Ra-228	1.000E+00	1.490E-08	1.337E-08	2.988E-13	5.993E-18	1.202E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	9.179E-10	2.642E-09	5.432E-08	1.865E-07	6.405E-07	7.553E-06	4.266E-04	8.595E-02	1.697E-01	3.344E-01
Ra-228	∑DOSE(j)		1.582E-08	1.601E-08	5.432E-08	1.865E-07	6.405E-07	7.553E-06	4.266E-04	8.595E-02	1.697E-01	3.344E-01
Th-228	Ra-228	1.000E+00	3.011E-07	7.389E-07	4.078E-11	6.063E-16	9.014E-21	1.995E-30	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-228	1.000E+00	1.630E-06	1.145E-06	7.633E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	1.260E-08	7.791E-08	4.948E-06	1.259E-05	3.206E-05	2.079E-04	5.383E-04	3.127E-03	6.954E-03	2.948E-02
Th-228	∑DOSE(j)		1.944E-06	1.962E-06	4.949E-06	1.259E-05	3.206E-05	2.079E-04	5.383E-04	3.127E-03	6.954E-03	2.948E-02
Th-232	Th-232	1.000E+00	7.614E-25	7.854E-25	1.705E-23	3.817E-22	8.547E-21	4.285E-18	1.876E-05	4.004E-03	7.899E-03	1.543E-02

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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Ra-228	Ra-228	1.000E+00	1.000E+00	8.864E-01	5.775E-06	3.335E-11	1.926E-16	6.424E-27	3.710E-32	2.143E-37	1.237E-42	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	1.136E-01	9.891E-01	9.779E-01	9.669E-01	9.453E-01	9.346E-01	9.241E-01	9.137E-01	8.933E-01
Ra-228	∑S(j):		1.000E+00	9.999E-01	9.891E-01	9.779E-01	9.669E-01	9.453E-01	9.346E-01	9.241E-01	9.137E-01	8.933E-01
Th-228	Ra-228	1.000E+00	0.000E+00	2.853E-01	8.653E-06	4.997E-11	2.886E-16	9.625E-27	5.559E-32	3.210E-37	1.854E-42	0.000E+00
Th-228	Th-228	1.000E+00	1.000E+00	6.960E-01	1.819E-16	3.310E-32	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	1.864E-02	9.891E-01	9.779E-01	9.669E-01	9.453E-01	9.346E-01	9.241E-01	9.137E-01	8.933E-01
Th-228	∑S(j):		1.000E+00	9.999E-01	9.891E-01	9.779E-01	9.669E-01	9.453E-01	9.346E-01	9.241E-01	9.137E-01	8.933E-01
Th-232	Th-232	1.000E+00	1.000E+00	9.999E-01	9.887E-01	9.776E-01	9.666E-01	9.450E-01	9.343E-01	9.238E-01	9.134E-01	8.930E-01

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

RESCALC.EXE execution time = 1.92 seconds

ATTACHMENT F: RESRAD Summary Report for Subsurface U-238+C

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:39 Page 1
Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.RAD

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Time = 1.000E+00 11
Time = 1.000E+02 12
Time = 2.000E+02 13
Time = 3.000E+02 14
Time = 5.000E+02 15
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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(4)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(7)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(8)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(9)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(10)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(11)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(12)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(13)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(14)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(15)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(16)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(3)
B-1	U-234	1.320E-01	1.320E-01	DCF2(4)
B-1	U-238	1.180E-01	1.180E-01	DCF2(5)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(6)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(3)
D-1	U-234	2.830E-04	2.830E-04	DCF3(4)
D-1	U-238	2.550E-04	2.550E-04	DCF3(5)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(6)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D-34				

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Summary : Breckenridge Subsurface U-238+C
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(4,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(4,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(5,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(5,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(4,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(4,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(5,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(5,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)

#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.

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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.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)	6.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.450E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(5)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(5)
R013	Cover depth (m)	1.500E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00		PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.194E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.216E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.132E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.600E+03	5.000E+01		DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.104E-04	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.104E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R017	Inhalation rate (m**3/yr)	8.600E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.101E-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)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01		SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.300E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.300E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.300E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5

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R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	0.000E+00	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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

       Area:    600.00 square meters                Pb-210     1.000E+00
  Thickness:      0.60 meters                       Ra-226     1.000E+00
Cover Depth:      1.50 meters                       Th-230     1.000E+00
                                                    U-234      1.000E+00
                                                    U-238      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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  1.573E-07  1.591E-07  4.812E-07  1.471E-06  4.498E-06  4.205E-05  1.016E-03  1.908E-01  3.779E-01  7.506E-01
        M(t):  6.293E-09  6.364E-09  1.925E-08  5.885E-08  1.799E-07  1.682E-06  4.062E-05  7.632E-03  1.512E-02  3.003E-02

Maximum TDOSE(t):  7.506E-01 mrem/yr   at t = 1.000E+03 years
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.886E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.572E-07	0.9993	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.412E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.025E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	7.233E-11	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.573E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.886E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.572E-07	0.9993
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.412E-11	0.0002
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.025E-16	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.233E-11	0.0005
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.573E-07	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.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.
Pb-210	2.832E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.589E-07	0.9989	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.034E-10	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	7.241E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	7.328E-11	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.591E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.832E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-07	0.9989
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.034E-10	0.0006
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.241E-16	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.328E-11	0.0005
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.591E-07	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.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.
Pb-210	4.431E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	4.604E-07	0.9570	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	2.044E-08	0.0425	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	9.214E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	2.664E-10	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.812E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.431E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.604E-07	0.9570
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.044E-08	0.0425
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.214E-12	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.664E-10	0.0006
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.812E-07	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	6.824E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.348E-06	0.9165	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.217E-07	0.0827	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.091E-10	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	9.817E-10	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.471E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.824E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.348E-06	0.9165
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.217E-07	0.0827
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.091E-10	0.0001
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.817E-10	0.0007
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	1.471E-06	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	1.057E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.949E-06	0.8779	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	5.449E-07	0.1211	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	7.295E-10	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.619E-09	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.498E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.057E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.949E-06	0.8779
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.449E-07	0.1211
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.295E-10	0.0002
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.619E-09	0.0008
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.498E-06	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	2.652E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.388E-05	0.8058	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	8.098E-06	0.1926	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.793E-08	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	4.927E-08	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.205E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.652E-18	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E-05	0.8058
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.098E-06	0.1926
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.793E-08	0.0004
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.927E-08	0.0012
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.205E-05	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:39 Page 16
Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.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 = 6.000E+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.
Pb-210	4.398E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.034E-12	0.0000	1.101E-14	0.0000	5.344E-15	0.0000	0.000E+00	0.0000
Ra-226	9.926E-05	0.0977	0.000E+00	0.0000	0.000E+00	0.0000	6.742E-04	0.6639	4.076E-06	0.0040	3.542E-06	0.0035	0.000E+00	0.0000
Th-230	2.903E-05	0.0286	0.000E+00	0.0000	0.000E+00	0.0000	1.945E-04	0.1915	1.160E-06	0.0011	1.019E-06	0.0010	0.000E+00	0.0000
U-234	7.685E-08	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	4.567E-06	0.0045	1.235E-08	0.0000	2.400E-08	0.0000	0.000E+00	0.0000
U-238	1.819E-07	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	3.866E-06	0.0038	8.909E-09	0.0000	2.034E-08	0.0000	0.000E+00	0.0000
Total	1.286E-04	0.1266	0.000E+00	0.0000	0.000E+00	0.0000	8.771E-04	0.8637	5.257E-06	0.0052	4.606E-06	0.0045	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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.050E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.811E-04	0.7691
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.257E-04	0.2222
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.680E-06	0.0046
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.077E-06	0.0040
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	1.016E-03	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	7.723E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-11	0.0000	1.307E-13	0.0000	5.605E-14	0.0000	0.000E+00	0.0000
Ra-226	2.909E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.383E-01	0.7250	1.152E-03	0.0060	8.849E-04	0.0046	0.000E+00	0.0000
Th-230	1.013E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	4.755E-02	0.2492	3.912E-04	0.0021	3.035E-04	0.0016	0.000E+00	0.0000
U-234	3.115E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.851E-04	0.0052	3.847E-06	0.0000	6.304E-06	0.0000	0.000E+00	0.0000
U-238	6.721E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.010E-04	0.0042	2.543E-06	0.0000	5.130E-06	0.0000	0.000E+00	0.0000
Total	3.932E-04	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	1.877E-01	0.9835	1.549E-03	0.0081	1.200E-03	0.0063	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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.769E-11	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E-01	0.7372
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.835E-02	0.2534
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.956E-04	0.0052
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.094E-04	0.0042
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	1.908E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 8.000E+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.
Pb-210	1.471E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.385E-12	0.0000	1.035E-14	0.0000	4.436E-15	0.0000	0.000E+00	0.0000
Ra-226	8.530E-04	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-01	0.6944	2.187E-03	0.0058	1.679E-03	0.0044	0.000E+00	0.0000
Th-230	3.462E-04	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	1.053E-01	0.2787	8.683E-04	0.0023	6.728E-04	0.0018	0.000E+00	0.0000
U-234	1.213E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.975E-03	0.0052	8.098E-06	0.0000	1.264E-05	0.0000	0.000E+00	0.0000
U-238	2.484E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.535E-03	0.0041	4.875E-06	0.0000	9.834E-06	0.0000	0.000E+00	0.0000
Total	1.203E-03	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	3.712E-01	0.9824	3.068E-03	0.0081	2.375E-03	0.0063	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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.399E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-01	0.7069
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.072E-01	0.2837
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.996E-03	0.0053
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.552E-03	0.0041
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.779E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface U-238+C
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	7.202E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.349E-15	0.0000	3.251E-17	0.0000	1.394E-17	0.0000	0.000E+00	0.0000
Ra-226	7.361E-03	0.0098	0.000E+00	0.0000	0.000E+00	0.0000	4.738E-01	0.6312	3.950E-03	0.0053	3.033E-03	0.0040	0.000E+00	0.0000
Th-230	3.888E-03	0.0052	0.000E+00	0.0000	0.000E+00	0.0000	2.480E-01	0.3304	2.049E-03	0.0027	1.585E-03	0.0021	0.000E+00	0.0000
U-234	1.689E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.029E-03	0.0054	1.818E-05	0.0000	2.579E-05	0.0000	0.000E+00	0.0000
U-238	3.398E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.826E-03	0.0038	8.984E-06	0.0000	1.811E-05	0.0000	0.000E+00	0.0000
Total	1.130E-02	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	7.286E-01	0.9707	6.026E-03	0.0080	4.662E-03	0.0062	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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.395E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.882E-01	0.6503
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.555E-01	0.3404
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.090E-03	0.0054
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.887E-03	0.0038
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	7.506E-01	1.0000

*Sum of all water independent and dependent pathways.

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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Ra-226+D	Ra-226+D	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01
Ra-226+D	Pb-210+D	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Ra-226+D	∑DSR(j)		1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	7.811E-04	1.407E-01	2.671E-01	4.882E-01
Th-230	Th-230	1.000E+00	2.105E-22	2.164E-22	3.436E-21	5.610E-20	9.160E-19	2.441E-16	3.746E-06	7.986E-04	1.574E-03	3.069E-03
Th-230	Ra-226+D	1.000E+00	3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	1.142E-04	2.098E-02	4.653E-02	1.124E-01
Th-230	Pb-210+D	1.000E+00	6.551E-20	4.596E-19	3.267E-15	2.954E-14	1.780E-13	4.653E-12	1.077E-04	2.657E-02	5.910E-02	1.400E-01
Th-230	∑DSR(j)		3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	2.257E-04	4.835E-02	1.072E-01	2.555E-01
U-234	U-234	1.000E+00	1.213E-23	1.249E-23	2.137E-22	3.764E-21	6.630E-20	2.057E-17	4.088E-06	8.482E-04	1.624E-03	2.987E-03
U-234	Th-230	1.000E+00	9.517E-28	2.926E-27	3.064E-24	9.836E-23	2.373E-21	1.024E-18	1.858E-08	4.556E-06	1.012E-05	2.398E-05
U-234	Ra-226+D	1.000E+00	1.025E-16	7.241E-16	9.214E-12	1.091E-10	7.295E-10	1.793E-08	3.024E-07	6.455E-05	1.630E-04	4.884E-04
U-234	Pb-210+D	1.000E+00	1.478E-25	2.226E-24	1.184E-18	2.312E-17	2.166E-16	9.711E-15	2.715E-07	7.834E-05	1.995E-04	5.905E-04
U-234	∑DSR(j)		1.025E-16	7.241E-16	9.214E-12	1.091E-10	7.295E-10	1.793E-08	4.680E-06	9.956E-04	1.996E-03	4.090E-03
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.822E-43	6.745E-38	1.992E-10	4.135E-08	7.919E-08	1.457E-07
U-238+D	U-238+D	9.999E-01	7.233E-11	7.328E-11	2.664E-10	9.817E-10	3.619E-09	4.926E-08	4.070E-06	8.075E-04	1.548E-03	2.878E-03
U-238+D	U-234	9.999E-01	1.728E-29	5.318E-29	6.090E-26	2.140E-24	5.650E-23	2.921E-20	6.967E-09	1.686E-06	3.689E-06	8.483E-06
U-238+D	Th-230	9.999E-01	9.013E-34	6.461E-33	4.344E-28	2.769E-26	9.961E-25	7.089E-22	1.537E-11	4.373E-09	1.105E-08	3.239E-08
U-238+D	Ra-226+D	9.999E-01	7.267E-23	1.100E-21	8.737E-16	2.061E-14	2.061E-13	8.410E-12	1.699E-10	4.223E-08	1.216E-07	4.539E-07
U-238+D	Pb-210+D	9.999E-01	8.391E-32	2.616E-30	9.443E-23	3.885E-21	5.614E-20	4.307E-18	1.455E-10	4.920E-08	1.436E-07	5.330E-07
U-238+D	∑DSR(j)		7.233E-11	7.328E-11	2.664E-10	9.817E-10	3.619E-09	4.927E-08	4.077E-06	8.093E-04	1.552E-03	2.887E-03

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	1.220E+13	1.414E+12	1.787E+13	*7.634E+13
Ra-226	1.590E+08	1.573E+08	5.430E+07	1.854E+07	6.330E+06	7.379E+05	3.201E+04	1.777E+02	9.359E+01	5.121E+01
Th 230	*2.018E+10	*2.018E+10	1.223E+09	2.054E+08	4.588E+07	3.087E+06	1.108E+05	5.171E+02	2.332E+02	9.785E+01
U-234	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	*6.247E+09	1.394E+09	5.341E+06	2.511E+04	1.252E+04	6.113E+03
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	3.089E+04	1.611E+04	8.658E+03

*At specific activity limit

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:39 Page 21
Summary : Breckenridge Subsurface U-238+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE U-238+C.RAD

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	1.000E+00	631 ± 1	5.136E-11	4.867E+11	4.395E-15	*7.634E+13
Ra-226	1.000E+00	1.000E+03	4.882E-01	5.121E+01	4.882E-01	5.121E+01
Th-230	1.000E+00	1.000E+03	2.555E-01	9.785E+01	2.555E-01	9.785E+01
U-234	1.000E+00	1.000E+03	4.090E-03	6.113E+03	4.090E-03	6.113E+03
U-238	1.000E+00	1.000E+03	2.887E-03	8.658E+03	2.887E-03	8.658E+03

*At specific activity limit

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:39 Page 22
Summary : Breckenridge Subsurface U-238+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Pb-210	Ra-226	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Pb-210	Th-230	1.000E+00	6.551E-20	4.596E-19	3.267E-15	2.954E-14	1.780E-13	4.653E-12	1.077E-04	2.657E-02	5.910E-02	1.400E-01
Pb-210	U-234	1.000E+00	1.478E-25	2.226E-24	1.184E-18	2.312E-17	2.166E-16	9.711E-15	2.715E-07	7.834E-05	1.995E-04	5.905E-04
Pb-210	U-238	9.999E-01	0.000E+00	2.616E-30	9.443E-23	3.885E-21	5.614E-20	4.307E-18	1.455E-10	4.920E-08	1.436E-07	5.330E-07
Pb-210	∑DOSE(j)		2.931E-14	2.968E-14	1.090E-13	4.195E-13	1.627E-12	2.556E-11	4.987E-04	1.070E-01	2.118E-01	4.159E-01
Ra-226	Ra-226	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01
Ra-226	Th-230	1.000E+00	3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	1.142E-04	2.098E-02	4.653E-02	1.124E-01
Ra-226	U-234	1.000E+00	1.025E-16	7.241E-16	9.214E-12	1.091E-10	7.295E-10	1.793E-08	3.024E-07	6.455E-05	1.630E-04	4.884E-04
Ra-226	U-238	9.999E-01	7.267E-23	1.100E-21	8.737E-16	2.061E-14	2.061E-13	8.410E-12	1.699E-10	4.223E-08	1.216E-07	4.539E-07
Ra-226	∑DOSE(j)		1.573E-07	1.590E-07	4.809E-07	1.470E-06	4.495E-06	4.200E-05	5.049E-04	8.133E-02	1.614E-01	3.258E-01
Th-230	Th-230	1.000E+00	2.105E-22	2.164E-22	3.436E-21	5.610E-20	9.160E-19	2.441E-16	3.746E-06	7.986E-04	1.574E-03	3.069E-03
Th-230	U-234	1.000E+00	9.517E-28	2.926E-27	3.064E-24	9.836E-23	2.373E-21	1.024E-18	1.858E-08	4.556E-06	1.012E-05	2.398E-05
Th-230	U-238	9.999E-01	0.000E+00	0.000E+00	4.344E-28	2.769E-26	9.961E-25	7.089E-22	1.537E-11	4.373E-09	1.105E-08	3.239E-08
Th-230	∑DOSE(j)		2.105E-22	2.164E-22	3.439E-21	5.620E-20	9.183E-19	2.452E-16	3.764E-06	8.032E-04	1.584E-03	3.093E-03
U-234	U-234	1.000E+00	1.213E-23	1.249E-23	2.137E-22	3.764E-21	6.630E-20	2.057E-17	4.088E-06	8.482E-04	1.624E-03	2.987E-03
U-234	U-238	9.999E-01	1.728E-29	5.318E-29	6.090E-26	2.140E-24	5.650E-23	2.921E-20	6.967E-09	1.686E-06	3.689E-06	8.483E-06
U-234	∑DOSE(j)		1.213E-23	1.249E-23	2.138E-22	3.766E-21	6.636E-20	2.060E-17	4.095E-06	8.498E-04	1.628E-03	2.995E-03
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.992E-10	4.135E-08	7.919E-08	1.457E-07
U-238	U-238	9.999E-01	7.233E-11	7.328E-11	2.664E-10	9.817E-10	3.619E-09	4.926E-08	4.070E-06	8.075E-04	1.548E-03	2.878E-03
U-238	∑DOSE(j)		7.233E-11	7.328E-11	2.664E-10	9.817E-10	3.619E-09	4.926E-08	4.070E-06	8.076E-04	1.548E-03	2.878E-03

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

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Summary : Breckenridge Subsurface U-238+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.682E-01	3.965E-02	1.572E-03	6.234E-05	9.801E-08	3.886E-09	1.541E-10	6.110E-12	9.606E-15
Pb-210	Ra-226	1.000E+00	0.000E+00	3.058E-02	8.913E-01	8.827E-01	8.406E-01	7.599E-01	7.224E-01	6.868E-01	6.530E-01	5.902E-01
Pb-210	Th-230	1.000E+00	0.000E+00	6.660E-06	2.858E-02	6.679E-02	1.031E-01	1.690E-01	1.989E-01	2.268E-01	2.529E-01	2.999E-01
Pb-210	U-234	1.000E+00	0.000E+00	2.004E-11	1.030E-05	5.213E-05	1.252E-04	3.524E-04	5.006E-04	6.682E-04	8.529E-04	1.264E-03
Pb-210	U-238	9.999E-01	0.000E+00	1.422E-17	8.170E-10	8.736E-09	3.239E-08	1.561E-07	2.680E-07	4.192E-07	6.134E-07	1.141E-06
Pb-210	∑S(j):		1.000E+00	9.988E-01	9.596E-01	9.512E-01	9.439E-01	9.293E-01	9.218E-01	9.143E-01	9.067E-01	8.914E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.995E-01	9.507E-01	9.039E-01	8.593E-01	7.767E-01	7.384E-01	7.020E-01	6.674E-01	6.033E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.331E-04	4.199E-02	8.139E-02	1.184E-01	1.854E-01	2.158E-01	2.442E-01	2.707E-01	3.185E-01
Ra-226	U-234	1.000E+00	0.000E+00	1.949E-09	1.883E-05	7.278E-05	1.582E-04	4.102E-04	5.707E-04	7.507E-04	9.475E-04	1.383E-03
Ra-226	U-238	9.999E-01	0.000E+00	1.842E-15	1.777E-09	1.371E-08	4.463E-08	1.922E-07	3.204E-07	4.908E-07	7.067E-07	1.285E-06
Ra-226	∑S(j):		1.000E+00	9.999E-01	9.927E-01	9.853E-01	9.778E-01	9.626E-01	9.548E-01	9.470E-01	9.391E-01	9.231E-01
Th-230	Th-230	1.000E+00	1.000E+00	9.999E-01	9.879E-01	9.759E-01	9.640E-01	9.407E-01	9.293E-01	9.180E-01	9.069E-01	8.850E-01
Th-230	U-234	1.000E+00	0.000E+00	9.000E-06	8.764E-04	1.707E-03	2.493E-03	3.941E-03	4.606E-03	5.234E-03	5.826E-03	6.912E-03
Th-230	U-238	9.999E-01	0.000E+00	1.276E-11	1.236E-07	4.792E-07	1.045E-06	2.726E-06	3.805E-06	5.020E-06	6.355E-06	9.331E-06
Th-230	∑S(j):		1.000E+00	9.999E-01	9.887E-01	9.776E-01	9.665E-01	9.447E-01	9.339E-01	9.232E-01	9.127E-01	8.919E-01
U-234	U-234	1.000E+00	1.000E+00	9.996E-01	9.595E-01	9.207E-01	8.834E-01	8.133E-01	7.804E-01	7.488E-01	7.185E-01	6.615E-01
U-234	U-238	9.999E-01	0.000E+00	2.834E-06	2.720E-04	5.221E-04	7.516E-04	1.154E-03	1.329E-03	1.487E-03	1.631E-03	1.878E-03
U-234	∑S(j):		1.000E+00	9.996E-01	9.598E-01	9.212E-01	8.842E-01	8.145E-01	7.818E-01	7.503E-01	7.202E-01	6.634E-01
U-238	U-238	5.400E-05	5.400E-05	5.398E-05	5.183E-05	4.975E-05	4.774E-05	4.398E-05	4.221E-05	4.052E-05	3.889E-05	3.582E-05
U-238	U-238	9.999E-01	9.999E-01	9.995E-01	9.597E-01	9.212E-01	8.841E-01	8.145E-01	7.817E-01	7.503E-01	7.201E-01	6.634E-01
U-238	∑S(j):		1.000E+00	9.996E-01	9.598E-01	9.212E-01	8.842E-01	8.145E-01	7.818E-01	7.503E-01	7.202E-01	6.634E-01

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

RESCALC.EXE execution time = 2.56 seconds

ATTACHMENT G: RESRAD Summary Report for Subsurface Th-230+C

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 1
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.RAD

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Summary : Breckenridge Subsurface Th-230+C
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(11)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(12)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(3)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(3,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D 5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(3,2)

#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.

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Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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)	6.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.450E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(3)
R013	Cover depth (m)	1.500E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06		WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.194E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.216E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.132E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R017	Inhalation rate (m**3/yr)	8.600E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E 01	5.000E 01		FIND
R017	Fraction of time spent outdoors (on site)	1.101E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.300E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.300E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.300E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	0.000E+00	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00		STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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

       Area:    600.00 square meters                Pb-210     1.000E+00
  Thickness:      0.60 meters                       Ra-226     1.000E+00
Cover Depth:      1.50 meters                       Th-230     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  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  1.573E-07  1.590E-07  4.809E-07  1.470E-06  4.494E-06  4.198E-05  1.007E-03  1.890E-01  3.743E-01  7.437E-01
        M(t):  6.290E-09  6.361E-09  1.924E-08  5.881E-08  1.798E-07  1.679E-06  4.027E-05  7.560E-03  1.497E-02  2.975E-02

Maximum TDOSE(t):  7.437E-01 mrem/yr   at t = 1.000E+03 years
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.886E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.572E-07	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.412E-11	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.573E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.886E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.572E-07	0.9998
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.412E-11	0.0002
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	1.573E-07	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.832E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.589E-07	0.9993	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.034E-10	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.590E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.832E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-07	0.9993
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.034E-10	0.0006
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.590E-07	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 11
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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.
Pb-210	4.431E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	4.604E-07	0.9575	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	2.044E-08	0.0425	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.809E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.431E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.604E-07	0.9575
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.044E-08	0.0425
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.809E-07	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 12
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	6.824E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.348E-06	0.9172	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.217E-07	0.0828	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.470E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.824E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.348E-06	0.9172
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.217E-07	0.0828
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	1.470E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 13
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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.
Pb-210	1.057E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.949E-06	0.8788	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	5.449E-07	0.1212	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.494E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.057E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.949E-06	0.8788
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.449E-07	0.1212
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.494E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 14
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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 = 5.000E+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.
Pb-210	2.652E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.388E-05	0.8071	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	8.098E-06	0.1929	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.198E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.652E-18	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E-05	0.8071
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.098E-06	0.1929
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.198E-05	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 15
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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 = 6.000E+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.
Pb-210	4.398E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.034E-12	0.0000	1.101E-14	0.0000	5.344E-15	0.0000	0.000E+00	0.0000
Ra-226	9.926E-05	0.0986	0.000E+00	0.0000	0.000E+00	0.0000	6.742E-04	0.6697	4.076E-06	0.0040	3.542E-06	0.0035	0.000E+00	0.0000
Th-230	2.903E-05	0.0288	0.000E+00	0.0000	0.000E+00	0.0000	1.945E-04	0.1932	1.160E-06	0.0012	1.019E-06	0.0010	0.000E+00	0.0000
Total	1.283E-04	0.1274	0.000E+00	0.0000	0.000E+00	0.0000	8.687E-04	0.8628	5.236E-06	0.0052	4.561E-06	0.0045	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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.050E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.811E-04	0.7758
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.257E-04	0.2242
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	1.007E-03	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 16
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	7.723E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-11	0.0000	1.307E-13	0.0000	5.605E-14	0.0000	0.000E+00	0.0000
Ra-226	2.909E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.383E-01	0.7319	1.152E-03	0.0061	8.849E-04	0.0047	0.000E+00	0.0000
Th-230	1.013E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	4.755E-02	0.2516	3.912E-04	0.0021	3.035E-04	0.0016	0.000E+00	0.0000
Total	3.922E-04	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	1.859E-01	0.9835	1.543E-03	0.0082	1.188E-03	0.0063	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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.769E-11	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E-01	0.7442
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.835E-02	0.2558
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	1.890E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 17
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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 = 8.000E+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.
Pb-210	1.471E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.385E-12	0.0000	1.035E-14	0.0000	4.436E-15	0.0000	0.000E+00	0.0000
Ra-226	8.530E-04	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-01	0.7010	2.187E-03	0.0058	1.679E-03	0.0045	0.000E+00	0.0000
Th-230	3.462E-04	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	1.053E-01	0.2813	8.683E-04	0.0023	6.728E-04	0.0018	0.000E+00	0.0000
Total	1.199E-03	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	3.677E-01	0.9824	3.055E-03	0.0082	2.352E-03	0.0063	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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.399E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-01	0.7136
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.072E-01	0.2864
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.743E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:42 Page 18
Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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.
Pb-210	7.202E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.349E-15	0.0000	3.251E-17	0.0000	1.394E-17	0.0000	0.000E+00	0.0000
Ra-226	7.361E-03	0.0099	0.000E+00	0.0000	0.000E+00	0.0000	4.738E-01	0.6371	3.950E-03	0.0053	3.033E-03	0.0041	0.000E+00	0.0000
Th-230	3.888E-03	0.0052	0.000E+00	0.0000	0.000E+00	0.0000	2.480E-01	0.3335	2.049E-03	0.0028	1.585E-03	0.0021	0.000E+00	0.0000
Total	1.125E-02	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	7.218E-01	0.9706	5.999E-03	0.0081	4.618E-03	0.0062	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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.395E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.882E-01	0.6564
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.555E-01	0.3436
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	7.437E-01	1.0000

*Sum of all water independent and dependent pathways.

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Summary : Breckenridge Subsurface Th-230+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE TH-230+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Ra-226+D	Ra-226+D	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01
Ra-226+D	Pb-210+D	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Ra-226+D	∑DSR(j)		1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	7.811E-04	1.407E-01	2.671E-01	4.882E-01
Th-230	Th-230	1.000E+00	2.105E-22	2.164E-22	3.436E-21	5.610E-20	9.160E-19	2.441E-16	3.746E-06	7.986E-04	1.574E-03	3.069E-03
Th-230	Ra-226+D	1.000E+00	3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	1.142E-04	2.098E-02	4.653E-02	1.124E-01
Th-230	Pb-210+D	1.000E+00	6.551E-20	4.596E-19	3.267E-15	2.954E-14	1.780E-13	4.653E-12	1.077E-04	2.657E-02	5.910E-02	1.400E-01
Th-230	∑DSR(j)		3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	2.257E-04	4.835E-02	1.072E-01	2.555E-01

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	1.220E+13	1.414E+12	1.787E+13	*7.634E+13
Ra-226	1.590E+08	1.573E+08	5.430E+07	1.854E+07	6.330E+06	7.379E+05	3.201E+04	1.777E+02	9.359E+01	5.121E+01
Th-230	*2.018E+10	*2.018E+10	1.223E+09	2.054E+08	4.588E+07	3.087E+06	1.108E+05	5.171E+02	2.332E+02	9.785E+01

*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 = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	1.000E+00	631 ± 1	5.136E-11	4.867E+11	4.395E-15	*7.634E+13
Ra-226	1.000E+00	1.000E+03	4.882E-01	5.121E+01	4.882E-01	5.121E+01
Th 230	1.000E+00	1.000E+03	2.555E 01	9.785E+01	2.555E 01	9.785E+01

*At specific activity limit

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Summary : Breckenridge Subsurface Th-230+C
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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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Pb-210	Ra-226	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Pb-210	Th-230	1.000E+00	6.551E-20	4.596E-19	3.267E-15	2.954E-14	1.780E-13	4.653E-12	1.077E-04	2.657E-02	5.910E-02	1.400E-01
Pb-210	∑DOSE(j)		2.931E-14	2.968E-14	1.090E-13	4.195E-13	1.627E-12	2.555E-11	4.984E-04	1.069E-01	2.116E-01	4.153E-01
Ra-226	Ra-226	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01
Ra-226	Th-230	1.000E+00	3.412E-11	1.034E-10	2.044E-08	1.217E-07	5.449E-07	8.098E-06	1.142E-04	2.098E-02	4.653E-02	1.124E-01
Ra-226	∑DOSE(j)		1.573E-07	1.590E-07	4.809E-07	1.470E-06	4.494E-06	4.198E-05	5.046E-04	8.127E-02	1.612E-01	3.253E-01
Th-230	Th-230	1.000E+00	2.105E-22	2.164E-22	3.436E-21	5.610E-20	9.160E-19	2.441E-16	3.746E-06	7.986E-04	1.574E-03	3.069E-03

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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.682E-01	3.965E-02	1.572E-03	6.234E-05	9.801E-08	3.886E-09	1.541E-10	6.110E-12	9.606E-15
Pb-210	Ra-226	1.000E+00	0.000E+00	3.058E-02	8.913E-01	8.827E-01	8.406E-01	7.599E-01	7.224E-01	6.868E-01	6.530E-01	5.902E-01
Pb-210	Th-230	1.000E+00	0.000E+00	6.660E-06	2.858E-02	6.679E-02	1.031E-01	1.690E-01	1.989E-01	2.268E-01	2.529E-01	2.999E-01
Pb-210	∑S(j):		1.000E+00	9.988E-01	9.596E-01	9.511E-01	9.438E-01	9.289E-01	9.213E-01	9.136E-01	9.059E-01	8.901E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.995E-01	9.507E-01	9.039E-01	8.593E-01	7.767E-01	7.384E-01	7.020E-01	6.674E-01	6.033E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.331E-04	4.199E-02	8.139E-02	1.184E-01	1.854E-01	2.158E-01	2.442E-01	2.707E-01	3.185E-01
Ra-226	∑S(j):		1.000E+00	9.999E-01	9.927E-01	9.853E-01	9.777E-01	9.621E-01	9.542E-01	9.462E-01	9.381E-01	9.218E-01
Th-230	Th-230	1.000E+00	1.000E+00	9.999E-01	9.879E-01	9.759E-01	9.640E-01	9.407E-01	9.293E-01	9.180E-01	9.069E-01	8.850E-01

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

RESCALC.EXE execution time = 1.52 seconds

ATTACHMENT H: RESRAD Summary Report for Subsurface Ra-226+C

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Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.RAD

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Time = 1.000E+00 10
Time = 1.000E+02 11
Time = 2.000E+02 12
Time = 3.000E+02 13
Time = 5.000E+02 14
Time = 6.000E+02 15
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Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(1)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(2)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(3)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(4)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(5)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(6)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(7)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(8)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(9)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(10)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(11)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)

#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.

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Summary : Breckenridge Subsurface Ra-226+C
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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)	6.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	6.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.450E+01	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)	1.000E+02	3.000E+00	---	T(3)
R011	Times for calculations (yr)	2.000E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	6.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	7.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	8.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	1.500E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.650E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	7.540E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	5.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.400E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.890E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	3.530E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

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Summary : Breckenridge Subsurface Ra-226+C
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	6.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.400E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	8.900E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.500E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.194E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	9.100E+03	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.216E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.600E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	3.140E-06	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	4.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	6.571E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.101E-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)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	4.270E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	4.660E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	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)	7.340E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	0.000E+00	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.826E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	4.785E+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	0.000E+00	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.300E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.300E-01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.300E-01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	0.000E+00	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E 01	9.000E 01		DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	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	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

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Site-Specific Parameter Summary (continued)

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

Summary of Pathway Selections

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

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

       Area:    600.00 square meters                Pb-210     1.000E+00
  Thickness:      0.60 meters                       Ra-226     1.000E+00
Cover Depth:      1.50 meters


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

   t (years):  0.000E+00  1.000E+00  1.000E+02  2.000E+02  3.000E+02  5.000E+02  6.000E+02  7.000E+02  8.000E+02  1.000E+03
    TDOSE(t):  1.572E-07  1.589E-07  4.604E-07  1.348E-06  3.949E-06  3.388E-05  7.811E-04  1.407E-01  2.671E-01  4.882E-01
        M(t):  6.289E-09  6.357E-09  1.842E-08  5.394E-08  1.580E-07  1.355E-06  3.124E-05  5.626E-03  1.069E-02  1.953E-02

Maximum TDOSE(t):  4.882E-01 mrem/yr   at t = 1.000E+03 years
```

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.886E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.572E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.572E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.886E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.572E-07	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.572E-07	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	2.832E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.589E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.589E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.832E-14	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-07	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.589E-07	1.0000

*Sum of all water independent and dependent pathways.

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

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.
Pb-210	4.431E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	4.604E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.604E-07	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.431E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.604E-07	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.604E-07	1.0000

*Sum of all water independent and dependent pathways.

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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	6.824E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.348E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.348E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.824E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.348E-06	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.348E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 13
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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.
Pb-210	1.057E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.949E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.949E-06	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.057E-16	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.949E-06	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.949E-06	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 14
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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 = 5.000E+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.
Pb-210	2.652E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	3.388E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.388E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.652E-18	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E-05	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E-05	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 15
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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 = 6.000E+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.
Pb-210	4.398E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.034E-12	0.0000	1.101E-14	0.0000	5.344E-15	0.0000	0.000E+00	0.0000
Ra-226	9.926E-05	0.1271	0.000E+00	0.0000	0.000E+00	0.0000	6.742E-04	0.8632	4.076E-06	0.0052	3.542E-06	0.0045	0.000E+00	0.0000
Total	9.926E-05	0.1271	0.000E+00	0.0000	0.000E+00	0.0000	6.742E-04	0.8632	4.076E-06	0.0052	3.542E-06	0.0045	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 = 6.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.050E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.811E-04	1.0000
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	7.811E-04	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 16
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.000E+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.
Pb-210	7.723E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-11	0.0000	1.307E-13	0.0000	5.605E-14	0.0000	0.000E+00	0.0000
Ra-226	2.909E-04	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	1.383E-01	0.9835	1.152E-03	0.0082	8.849E-04	0.0063	0.000E+00	0.0000
Total	2.909E-04	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	1.383E-01	0.9835	1.152E-03	0.0082	8.849E-04	0.0063	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 = 7.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.769E-11	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.407E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 17
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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 = 8.000E+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.
Pb-210	1.471E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.385E-12	0.0000	1.035E-14	0.0000	4.436E-15	0.0000	0.000E+00	0.0000
Ra-226	8.530E-04	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-01	0.9823	2.187E-03	0.0082	1.679E-03	0.0063	0.000E+00	0.0000
Total	8.530E-04	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	2.624E-01	0.9823	2.187E-03	0.0082	1.679E-03	0.0063	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 = 8.000E+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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.399E-12	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 18
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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.
Pb-210	7.202E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.349E-15	0.0000	3.251E-17	0.0000	1.394E-17	0.0000	0.000E+00	0.0000
Ra-226	7.361E-03	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	4.738E-01	0.9706	3.950E-03	0.0081	3.033E-03	0.0062	0.000E+00	0.0000
Total	7.361E-03	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	4.738E-01	0.9706	3.950E-03	0.0081	3.033E-03	0.0062	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.
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.395E-15	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.882E-01	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.882E-01	1.0000

*Sum of all water independent and dependent pathways.

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 19
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210+D	Pb-210+D	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Ra-226+D	Ra-226+D	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01
Ra-226+D	Pb-210+D	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Ra-226+D	∑DSR(j)		1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	7.811E-04	1.407E-01	2.671E-01	4.882E-01

The DSR includes contributions from associated (half-life ≤ 180 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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	1.220E+13	1.414E+12	1.787E+13	*7.634E+13
Ra-226	1.590E+08	1.573E+08	5.430E+07	1.854E+07	6.330E+06	7.379E+05	3.201E+04	1.777E+02	9.359E+01	5.121E+01

*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 = 1.000E+03 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Pb-210	1.000E+00	631 ± 1	5.136E-11	4.867E+11	4.395E-15	*7.634E+13
Ra-226	1.000E+00	1.000E+03	4.882E-01	5.121E+01	4.882E-01	5.121E+01

*At specific activity limit

RESRAD, Version 6.4 T½ Limit = 180 days 11/17/2010 16:44 Page 20
Summary : Breckenridge Subsurface Ra-226+C
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\BRECKENRIDGE SUBSURFACE RA-226+C.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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	2.886E-14	2.832E-14	4.431E-15	6.824E-16	1.057E-16	2.652E-18	2.050E-12	1.769E-11	1.399E-12	4.395E-15
Pb-210	Ra-226	1.000E+00	4.519E-16	1.352E-15	1.013E-13	3.893E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Pb-210	∑DOSE(j)		2.931E-14	2.968E-14	1.057E-13	3.900E-13	1.449E-12	2.089E-11	3.907E-04	8.037E-02	1.525E-01	2.753E-01
Ra-226	Ra-226	1.000E+00	1.572E-07	1.589E-07	4.604E-07	1.348E-06	3.949E-06	3.388E-05	3.904E-04	6.028E-02	1.147E-01	2.129E-01

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	1.000E+02	2.000E+02	3.000E+02	5.000E+02	6.000E+02	7.000E+02	8.000E+02	1.000E+03
Pb-210	Pb-210	1.000E+00	1.000E+00	9.682E-01	3.965E-02	1.572E-03	6.234E-05	9.801E-08	3.886E-09	1.541E-10	6.110E-12	9.606E-15
Pb-210	Ra-226	1.000E+00	0.000E+00	3.058E-02	8.913E-01	8.827E-01	8.406E-01	7.599E-01	7.224E-01	6.868E-01	6.530E-01	5.902E-01
Pb-210	∑S(j):		1.000E+00	9.988E-01	9.310E-01	8.843E-01	8.407E-01	7.599E-01	7.224E-01	6.868E-01	6.530E-01	5.902E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	9.995E-01	9.507E-01	9.039E-01	8.593E-01	7.767E-01	7.384E-01	7.020E-01	6.674E-01	6.033E-01

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

RESCALC.EXE execution time = 1.56 seconds

ATTACHMENT I: Scan MDC MicroShield® Outputs for NUREG-1507 Hot Spot Model

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

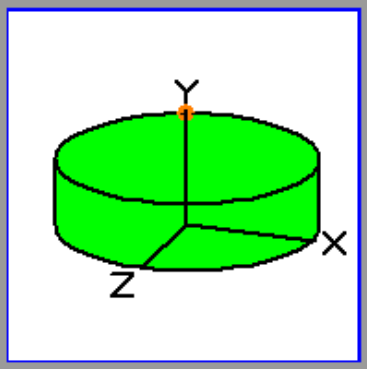
Filename	Run Date	Run Time	Duration
Th-232+C Hot Spot.msd	December 10, 2010	4:03:51 PM	00:00:00

Project Info	
Case Title	Th-232+C Hot Spot
Description	Model per NUREG-1507 Section 6.8.2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Pb-212	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Po-212	1.8916e-007	6.9989e+003	5.1200e-006	1.8944e-001
Po-216	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Ra-224	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Ra-228	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Rn-220	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Th-228	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Th-232	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Tl-208	1.0640e-007	3.9369e+003	2.8800e-006	1.0656e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	8.091e+03	8.131e-05	9.474e-05	6.974e-06	8.126e-06
0.06	7.561e+01	8.886e-05	4.889e-04	1.765e-07	9.711e-07
0.08	4.694e+03	9.910e-03	5.775e-02	1.568e-05	9.139e-05
0.1	7.760e+02	2.374e-03	1.266e-02	3.633e-06	1.936e-05
0.15	4.596e+02	2.512e-03	1.048e-02	4.136e-06	1.726e-05
0.2	5.940e+03	4.759e-02	1.621e-01	8.400e-05	2.861e-04
0.3	2.803e+03	3.814e-02	1.029e-01	7.234e-05	1.953e-04
0.4	2.484e+02	4.918e-03	1.150e-02	9.583e-06	2.240e-05
0.5	1.481e+03	3.922e-02	8.302e-02	7.699e-05	1.630e-04
0.6	3.484e+03	1.171e-01	2.300e-01	2.285e-04	4.489e-04
0.8	1.905e+03	9.313e-02	1.641e-01	1.771e-04	3.122e-04
1.0	6.227e+03	4.067e-01	6.684e-01	7.496e-04	1.232e-03
1.5	1.092e+03	1.202e-01	1.765e-01	2.022e-04	2.969e-04
2.0	1.151e+01	1.820e-03	2.500e-03	2.814e-06	3.867e-06
3.0	3.929e+03	1.019e+00	1.301e+00	1.383e-03	1.764e-03
Totals	**4.122e+04**	**1.903e+00**	**2.983e+00**	**3.017e-03**	**4.862e-03**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

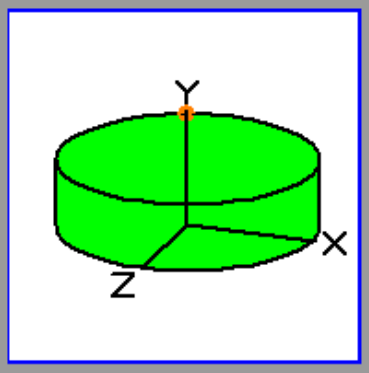
Filename	Run Date	Run Time	Duration
U-238+D Hot Spot.msd	December 10, 2010	4:06:06 PM	00:00:00

Project Info	
Case Title	U-238+D Hot Spot
Description	Model per NUREG-1507 Section 6.8.2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Pa-234m	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Th-234	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
U-238	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.067e+03	2.077e-05	2.420e-05	1.781e-06	2.076e-06
0.06	4.274e+02	5.024e-04	2.764e-03	9.978e-07	5.490e-06
0.08	1.552e+01	3.277e-05	1.910e-04	5.186e-08	3.023e-07

0.1	6.611e+02	2.023e-03	1.078e-02	3.095e-06	1.650e-05
0.8	2.260e+01	1.105e-03	1.947e-03	2.101e-06	3.703e-06
1.0	1.053e+02	6.878e-03	1.130e-02	1.268e-05	2.084e-05
Totals	**3.299e+03**	**1.056e-02**	**2.701e-02**	**2.071e-05**	**4.891e-05**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

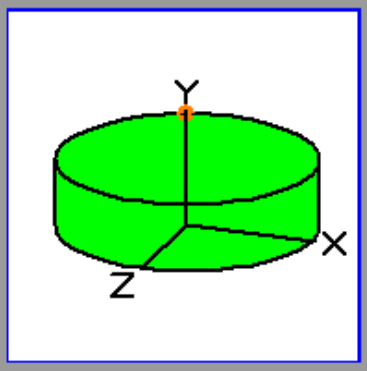
Filename	Run Date	Run Time	Duration
U-234 Hot Spot.msd	December 10, 2010	4:14:47 PM	00:00:00

Project Info	
Case Title	U-234 Hot Spot
Description	Model per NUREG-1507 Section 6.8.2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
U-234	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.149e+03	1.154e-05	1.345e-05	9.900e-07	1.154e-06
0.05	1.290e+01	9.614e-06	4.456e-05	2.561e-08	1.187e-07
0.1	4.380e+00	1.340e-05	7.145e-05	2.050e-08	1.093e-07
Totals	**1.166e+03**	**3.456e-05**	**1.295e-04**	**1.036e-06**	**1.382e-06**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

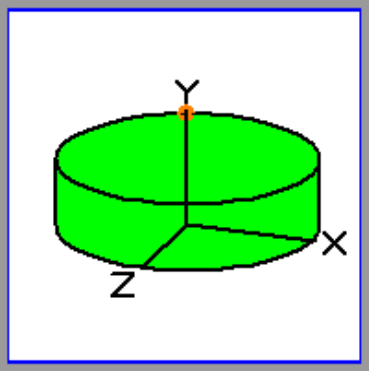
Filename	Run Date	Run Time	Duration
Th-230 Hot Spot.msd	December 10, 2010	4:08:08 PM	00:00:00

Project Info	
Case Title	Th-230 Hot Spot
Description	Model per NUREG-1507 Section 6.8.2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Th-230	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.219e+02	9.264e-06	1.079e-05	7.946e-07	9.259e-07
0.06	4.079e+01	4.794e-05	2.638e-04	9.522e-08	5.239e-07
0.15	7.537e+00	4.118e-05	1.719e-04	6.781e-08	2.831e-07
Totals	**9.702e+02**	**9.838e-05**	**4.464e-04**	**9.576e-07**	**1.733e-06**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

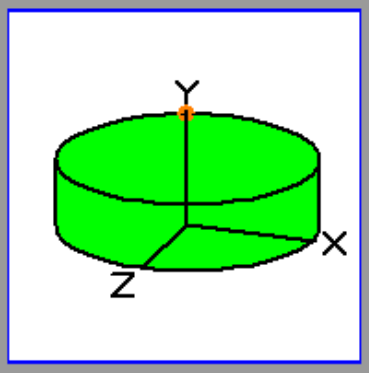
Filename	Run Date	Run Time	Duration
Ra-226+C Hot Spot.msd	December 10, 2010	4:09:03 PM	00:00:00

Project Info	
Case Title	Ra-226+C Hot Spot
Description	Model per NUREG-1507 Section 6.8.2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Bi-210	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Bi-214	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Pb-210	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Pb-214	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Po-210	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Po-214	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Po-218	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Ra-226	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001
Rn-222	2.9556e-007	1.0936e+004	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.282e+03	4.303e-05	5.014e-05	3.690e-06	4.300e-06
0.05	5.638e+02	4.200e-04	1.947e-03	1.119e-06	5.187e-06
0.08	2.521e+03	5.323e-03	3.102e-02	8.423e-06	4.909e-05
0.1	1.484e+01	4.541e-05	2.421e-04	6.948e-08	3.704e-07
0.2	1.178e+03	9.437e-03	3.214e-02	1.666e-05	5.673e-05
0.3	2.257e+03	3.071e-02	8.288e-02	5.825e-05	1.572e-04
0.4	4.185e+03	8.286e-02	1.937e-01	1.614e-04	3.774e-04
0.5	1.954e+02	5.175e-03	1.095e-02	1.016e-05	2.150e-05
0.6	5.273e+03	1.772e-01	3.481e-01	3.458e-04	6.794e-04
0.8	1.033e+03	5.052e-02	8.902e-02	9.609e-05	1.693e-04
1.0	3.424e+03	2.236e-01	3.675e-01	4.122e-04	6.775e-04
1.5	2.082e+03	2.291e-01	3.364e-01	3.855e-04	5.660e-04
2.0	2.927e+03	4.626e-01	6.357e-01	7.154e-04	9.831e-04
Totals	**2.993e+04**	**1.277e+00**	**2.130e+00**	**2.215e-03**	**3.747e-03**

ATTACHMENT J: ProUCL Output for UCL of $R_{Th\text{-}230:Th\text{-}232}$

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Th 230:Th 232

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics		Log-transformed Statistics	
Minimum	7.8	Minimum of Log Data	2.054
Maximum	10.9	Maximum of Log Data	2.389
Mean	9.23	Mean of log Data	2.217
Median	9.3	SD of log Data	0.108
SD	0.989		
Coefficient of Variation	0.107		
Skewness	0.0219		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.966	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9.803	95% H-UCL	9.856
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.61
95% Adjusted-CLT UCL (Chen-1995)	9.747	97.5% Chebyshev (MVUE) UCL	11.2
95% Modified-t UCL (Johnson-1978)	9.804	99% Chebyshev (MVUE) UCL	12.37

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	67.31	Data appear Normal at 5% Significance Level	
Theta Star	0.137		
MLE of Mean	9.23		
MLE of Standard Deviation	1.125		
nu star	1346		
Approximate Chi Square Value (.05)	1262	Nonparametric Statistics	
Adjusted Level of Significance	0.0267	95% CLT UCL	9.744
Adjusted Chi Square Value	1248	95% Jackknife UCL	9.803
		95% Standard Bootstrap UCL	9.726
Anderson-Darling Test Statistic	0.226	95% Bootstrap-t UCL	9.792
Anderson-Darling 5% Critical Value	0.724	95% Hall's Bootstrap UCL	9.77
Kolmogorov-Smirnov Test Statistic	0.163	95% Percentile Bootstrap UCL	9.71
Kolmogorov-Smirnov 5% Critical Value	0.266	95% BCA Bootstrap UCL	9.69
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10.59
		97.5% Chebyshev(Mean, Sd) UCL	11.18
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	12.34
95% Approximate Gamma UCL	9.846		
95% Adjusted Gamma UCL	9.958		

Potential UCL to Use	Use 95% Student's-t UCL 9.803

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

ATTACHMENT K: *In Situ* NaI Measurements, Sample Activity Concentrations, and SOF Calculations

	Sample ID	*In Situ* NaI (cpm)	On-Site Gamma Spectroscopy Activity Concentration (pCi/g)			Surface SOF	Subsurface SOF
			U-238	Ra-226	Th-232	U-238 Modified to Account for U-234 Th-232 Modified to Account for Th-230	
1	SU2B002L00	6,120	2.97E-01	7.36E-01	7.29E-01	0.293	0.098
2	SU1B003L00	6,250	8.64E-02	7.52E-01	7.91E-01	0.310	0.106
3	SU1B005L00	6,334	6.32E-01	8.33E-01	6.69E-01	0.295	0.093
4	SU1B006L00	6,491	3.76E-01	8.16E-01	6.00E-01	0.276	0.085
5	SU1B012L00	6,705	6.29E-01	4.01E-01	6.49E-01	0.221	0.083
6	SU3B013L00	6,713	2.85E-01	5.78E-01	5.86E-01	0.233	0.079
7	SU3B013L00S	6,713	2.34E-01	7.53E-01	3.86E-01	0.214	0.059
8	SU1B002L00	6,716	3.88E-01	7.59E-01	6.74E-01	0.284	0.092
9	SU1B008L00	6,750	3.11E-01	0.00E+00	4.94E-01	0.118	0.057
10	SU1B004L00	6,780	4.59E-01	6.64E-01	4.05E-01	0.205	0.060
11	SU1B007L00	6,812	6.40E-01	7.68E-01	5.48E-01	0.256	0.078
12	SU1B001L00	6,857	7.60E-01	3.00E-01	5.29E-01	0.176	0.067
13	SU2B001L00	6,938	2.37E-01	1.03E+00	6.86E-01	0.330	0.099
14	SU1B011L00	7,095	7.92E-01	5.56E-01	4.94E-01	0.209	0.068
15	SU2B008L00	7,131	4.52E-01	4.67E-01	8.31E-01	0.274	0.105
16	SU3B007L00	7,300	2.13E-01	1.23E+00	6.70E-01	0.359	0.101
17	SU2B004L00	8,046	8.44E-01	3.82E-01	8.08E-01	0.256	0.101
18	SU2B009L01	8,360	6.59E-01	8.96E-01	2.17E+00	0.663	0.267
19	SU2B003L00	8,483	6.84E-01	1.23E+00	9.15E-01	0.417	0.129
20	SU3B002L00	8,551	7.32E-01	1.27E+00	1.11E+00	0.471	0.153
21	SU2B006L00	8,690	8.69E-01	8.02E-01	7.82E-01	0.318	0.106
22	SU2B009L00	8,817	1.04E+00	-2.03E-01	7.97E-01	0.160	0.088
23	SU3FSSS006	8,967	5.44E-01	9.15E-01	7.38E-01	0.325	0.103
24	SU2B012L00	8,972	1.08E+00	7.59E-01	9.85E-01	0.360	0.128
25	SU3FSSS002	9,066	6.31E-01	1.43E+00	7.50E-01	0.411	0.114
26	SU3CWA5B05	9,138	5.22E-01	1.64E+00	7.90E-01	0.454	0.123
27	SU2B010L00	9,194	6.84E-01	7.86E-01	1.17E+00	0.407	0.150
28	SU2B010L00S	9,194	6.96E-01	7.63E-01	1.22E+00	0.415	0.155
29	SU3FSSS001	9,294	4.47E-01	2.49E-01	4.36E-01	0.145	0.055
30	SU3FSSS012	9,294	4.46E-01	4.60E-01	5.53E-01	0.207	0.073
31	SU3CWA5B01	9,374	6.70E-01	5.87E-01	9.32E-01	0.318	0.119
32	SU3CWA5B02	9,383	1.85E-01	8.13E-01	5.63E-01	0.266	0.081
33	SU3B001L01	9,432	3.19E-01	1.14E+00	1.60E+00	0.566	0.206
34	SU3FSSS007	9,496	7.69E-01	9.34E-01	7.72E-01	0.337	0.107
35	SU3CWA5B04	9,530	6.86E-01	4.86E-01	6.09E-01	0.225	0.080
36	SU3B004L00	9,620	9.23E-01	5.08E-01	1.23E+00	0.377	0.152
37	SU3B004L00S	9,620	1.01E+00	1.53E+00	1.25E+00	0.546	0.174
38	SU3CWA5B06	9,738	7.32E-01	1.13E+00	6.12E-01	0.330	0.093
39	SU3CWA6B01	9,805	1.12E+00	7.96E-01	6.38E-01	0.283	0.089
40	SU3CWA5B03	9,862	1.64E+00	5.50E-01	5.79E-01	0.231	0.078
41	SU2B005L00	9,880	1.28E+00	3.96E-01	1.64E+00	0.458	0.197
42	SU2B007L01	9,970	3.48E-01	1.94E+00	2.05E+00	0.801	0.274
43	SU3CWA6B02	10,017	1.49E+00	1.31E+00	1.22E+00	0.507	0.167

	Sample ID	*In Situ* NaI (cpm)	On-Site Gamma Spectroscopy Activity Concentration (pCi/g)			Surface SOF	Subsurface SOF
			U-238	Ra-226	Th-232	U-238 Modified to Account for U-234 Th-232 Modified to Account for Th-230	
44	SU3B002L01	10,044	1.03E+00	1.55E+00	2.49E+00	0.846	0.317
45	SU3FSSS009	10,056	6.76E-01	1.37E+00	9.97E-01	0.460	0.142
46	SU3FSSS010	10,143	5.02E-01	1.00E+00	6.59E-01	0.320	0.095
47	SU3FSSS003	10,179	2.42E+00	2.50E+00	2.86E+00	**1.090**	0.378
48	SU3FSSS005	10,216	1.08E+00	8.43E-01	8.37E-01	0.338	0.113
49	SU3CWA7B04	10,275	1.79E-01	4.16E-01	9.35E-01	0.290	0.116
50	SU3B012L00	10,280	3.73E-01	1.28E+00	2.44E+00	0.789	0.306
51	SU3B008L00	10,294	1.17E+00	1.48E+00	1.30E+00	0.552	0.179
52	SU3CWA6B03	10,425	1.90E+00	1.53E-01	7.19E-01	0.201	0.086
53	SU3CWA7B05	10,589	1.96E+00	3.35E-01	1.30E+00	0.369	0.157
54	SU2B005L01	10,734	1.10E+00	2.06E+00	1.05E+00	0.585	0.161
55	SU2B011L01	10,771	3.32E+00	9.36E-01	1.45E+00	0.505	0.186
56	SU3FSSS008	11,019	3.22E-01	9.16E-01	6.69E-01	0.308	0.095
57	SU2B010L01	11,110	1.48E+00	1.91E+00	1.11E+00	0.576	0.165
58	SU2B007L00	11,185	1.10E+00	8.03E-01	2.19E+00	0.654	0.268
59	SU3CWA6B04	11,190	1.47E+00	1.51E+00	9.79E-01	0.481	0.143
60	SU3CWA5B15	11,299	1.21E+00	1.97E+00	6.56E-01	0.477	0.114
61	SU3CWA5B09	11,366	1.07E+00	9.84E-01	6.14E-01	0.308	0.090
62	SU3CWA4B04	11,482	1.74E+00	1.32E+00	8.39E-01	0.417	0.123
63	SU3CWA7B06	11,554	4.01E-01	1.22E+00	1.16E+00	0.474	0.157
64	SU3CWA4B01	11,606	1.17E+00	7.54E-01	9.93E-01	0.361	0.129
65	SU3CWA5B10	11,749	4.51E-01	8.12E-01	5.99E-01	0.275	0.085
66	SU3CWA3B02	11,847	5.03E-01	8.61E-01	1.01E+00	0.381	0.133
67	SU3CWA4B05	11,918	1.05E+00	1.12E+00	5.63E-01	0.317	0.087
68	SU3CWA3B03	12,114	4.55E-01	2.43E+00	4.39E-01	0.497	0.098
69	SU3B003L01	12,311	2.86E-01	1.56E+00	1.03E+00	0.497	0.149
70	SU3B003L01S	12,311	9.16E-01	9.79E-01	1.42E+00	0.498	0.183
71	SU3FSSS004	12,328	1.08E+00	2.57E-01	1.26E+00	0.345	0.150
72	SU3CWA4B06	12,857	1.04E+00	5.21E-01	8.64E-01	0.293	0.110
73	SU3FSSS011	13,019	9.27E-01	1.80E+00	1.43E+00	0.633	0.200
74	SU3FSSS011S	13,019	5.98E-01	1.33E+00	1.38E+00	0.545	0.185
75	SU3CWA4B02	13,050	9.13E-01	1.02E+00	7.91E-01	0.354	0.111
76	SU3CWA7B01	13,137	1.14E+00	5.37E-01	8.97E-01	0.303	0.114
77	SU3CWA5B12	13,186	1.34E+00	1.44E+00	8.79E-01	0.445	0.130
78	SU2B002L01	13,358	2.99E+00	4.58E-01	2.34E+00	0.639	0.279
79	SU3CWA5B13	13,916	7.39E-01	4.56E-01	4.78E-01	0.189	0.064
80	SU3CWA5B11	14,145	2.70E+00	9.98E-01	1.78E+00	0.592	0.225
81	SU1B009L00	14,633	7.57E-01	1.06E+00	8.07E-01	0.365	0.114
82	SU3CWA3B01	14,679	5.37E-01	1.78E+00	6.08E-01	0.433	0.105
83	SU3B009L00	14,811	1.29E+00	1.97E+00	2.78E+00	0.983	0.358
84	SU3B003L00	14,845	8.07E-01	2.85E+00	2.11E+00	0.965	0.298
85	SU3B012L01	14,918	1.09E+00	1.46E+00	2.86E+00	0.919	0.357
86	SU3CWA5B14	14,945	2.41E+00	1.93E+00	2.52E+00	0.918	0.328
87	SU3B011L01	15,206	1.20E+00	9.82E-01	3.28E+00	0.942	0.397

	Sample ID	*In Situ* NaI (cpm)	On-Site Gamma Spectroscopy Activity Concentration (pCi/g)			Surface SOF	Subsurface SOF
			U-238	Ra-226	Th-232	U-238 Modified to Account for U-234 Th-232 Modified to Account for Th-230	
88	SU3B008L01	15,321	1.03E+00	7.32E-01	2.06E+00	0.611	0.251
89	SU3B005L00	15,422	1.14E+00	1.23E+00	2.85E+00	0.879	0.352
90	SU3FSSB001	15,447	4.73E+00	2.94E+00	6.20E+00	**1.963**	0.772
91	SU2B013L01	15,505	2.43E+00	1.78E+00	1.54E+00	0.660	0.212
92	SU3CWA4B07	16,567	1.23E+01	4.43E+00	1.20E+01	**3.607**	**1.471**
93	SU3B006L01	16,887	9.85E-01	1.06E+00	1.38E+00	0.502	0.180
94	SU2B014L01	17,025	5.01E+00	3.04E+00	4.08E+00	**1.475**	0.530
95	SU2B014L01S	17,025	5.96E+00	2.31E+00	3.82E+00	**1.298**	0.486
96	SU2B001L01	17,083	2.14E+00	2.24E+00	2.43E+00	0.945	0.324
97	SU2B004L01	17,382	1.54E+00	2.35E+00	4.89E+00	**1.548**	0.608
98	SU3CWA7B02	17,485	8.48E+00	3.75E+00	8.03E+00	**2.539**	0.999
99	SU3FSSB004	18,092	3.05E+00	7.95E-01	8.21E-01	0.332	0.111
100	SU3FSSB003	18,583	5.55E+00	2.03E+00	3.73E+00	**1.231**	0.470
101	SU2B011L00	18,866	1.42E+00	1.58E+00	4.19E+00	**1.257**	0.513
102	SU3FSSB002	18,954	7.66E-01	2.02E+00	3.60E+00	**1.184**	0.453
103	SU3CWA7B03	18,959	3.47E+00	1.19E+00	9.74E-01	0.432	0.136
104	SU3CWA3B04	20,201	1.40E+00	2.88E+00	4.32E+00	**1.496**	0.553
105	SU2B006L01	20,398	1.70E+00	4.82E-01	2.55E+00	0.689	0.303
106	SU2B006L01S	20,398	1.09E+00	6.97E-01	3.12E+00	0.858	0.373
107	SU1B010L00	20,925	4.46E+00	1.16E+01	1.34E+00	**2.195**	0.381
108	SU1B010L00S	20,925	4.68E+00	9.87E+00	1.32E+00	**1.919**	0.346
109	SU3B004L01	22,004	2.18E+00	3.74E+00	5.68E+00	**1.961**	0.726
110	SU3FSSB006	22,532	6.14E+00	2.91E+00	6.38E+00	**2.004**	0.792
111	SU3FSSB006S	22,532	5.53E+00	2.18E+00	6.85E+00	**1.997**	0.832
112	SU3B011L00	23,577	1.91E+00	2.26E+00	3.15E+00	**1.120**	0.407
113	SU3B013L01	23,968	1.16E+00	2.98E+00	3.29E+00	**1.267**	0.437
114	SU3B013L01S	23,968	1.25E+00	3.16E+00	4.03E+00	**1.472**	0.525
115	SU3CWA5B08	26,453	1.30E+01	4.99E+00	1.72E+01	**4.930**	**2.076**
116	SU3CWA5B07	26,693	4.49E+00	8.02E-01	8.41E-01	0.341	0.114
117	SU3CWA4B03	27,490	9.28E+00	6.45E+00	1.43E+01	**4.470**	**1.773**
118	SU2B008L01	31,171	8.15E+00	3.76E+00	6.60E+01	**16.341**	**7.662**
119	SU2B008L01S	31,171	1.27E+01	1.42E+00	6.11E+01	**14.810**	**7.054**
120	SU3FSSB005	31,578	3.94E+00	1.29E+00	1.87E+00	0.664	0.241
121	SU3B006L00	32,323	3.27E+00	4.53E+00	9.94E+00	**3.106**	**1.232**
122	SU3B005L01	38,791	2.48E+00	3.44E+00	6.33E+00	**2.068**	0.795
123	SU3B005L01S	38,791	3.37E+00	8.73E-01	7.21E+00	**1.866**	0.847
124	SU3B010L01	40,481	5.56E+00	8.54E+00	2.51E+01	**7.368**	**3.053**
125	SU3B010L01S	40,481	8.35E+00	7.91E+00	2.76E+01	**7.869**	**3.329**
126	SU2B003L01	41,095	2.63E+01	2.51E+01	2.03E+02	**52.457**	**23.832**
127	SU2B003L01S	41,095	2.69E+01	3.12E+01	1.95E+02	**51.531**	**23.031**
128	SU3B001L00	44,005	2.14E+00	4.54E+00	8.73E+00	**2.816**	**1.093**
129	SU2B012L01	51,195	9.03E+01	3.78E+01	5.12E+01	**18.529**	**6.649**
130	SU2B012L01S	51,195	8.74E+01	3.89E+01	4.86E+01	**18.074**	**6.370**
131	SU3B014L01	54,525	8.47E+00	1.94E+01	3.30E+01	**11.005**	**4.174**

Sample ID		*In Situ* NaI (cpm)	On-Site Gamma Spectroscopy Activity Concentration (pCi/g)			Surface SOF	Subsurface SOF
			U-238	Ra-226	Th-232	U-238 Modified to Account for U-234 Th-232 Modified to Account for Th-230	
132	SU3B014L01S	54,525	1.33E+01	2.22E+01	3.62E+01	**12.237**	**4.599**
133	SU3B007L01	85,476	2.86E+01	2.05E+01	5.26E+01	**15.908**	**6.455**
134	SU3B007L01S	85,476	3.03E+01	1.99E+01	5.73E+01	**16.925**	**6.983**
135	SU3B010L00	89,886	1.93E+01	1.42E+01	3.94E+01	**11.716**	**4.811**
136	SU3B009L01	114,227	1.27E+01	1.09E+01	3.50E+01	**10.129**	**4.240**

ATTACHMENT L: Field Efficiency MicroShield® Outputs for Area Bounded by FSS Samples

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

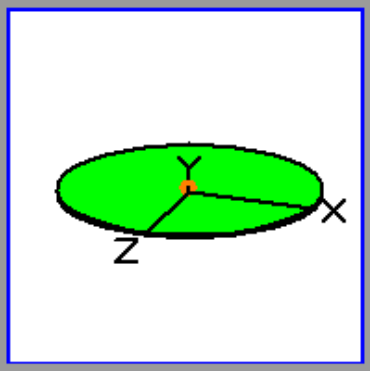
Filename	Run Date	Run Time	Duration
Th-232+C SU3 Bounded Area.msd	December 10, 2010	4:10:52 PM	00:00:00

Project Info	
Case Title	Th-232+C SU3
Description	SU3 FSS Bounded Area = 118.5 m^2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	614.0 cm (20 ft 1.7 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.78e+07 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Pb-212	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Po-212	9.0959e-005	3.3655e+006	5.1200e-006	1.8944e-001
Po-216	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Ra-224	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Ra-228	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Rn-220	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Th-228	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Th-232	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Tl-208	5.1165e-005	1.8931e+006	2.8800e-006	1.0656e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.891e+06	8.697e-05	1.043e-04	7.460e-06	8.945e-06
0.06	3.636e+04	1.362e-04	7.978e-04	2.706e-07	1.585e-06
0.08	2.257e+06	1.547e-02	1.011e-01	2.448e-05	1.599e-04
0.1	3.731e+05	3.754e-03	2.335e-02	5.743e-06	3.572e-05
0.15	2.210e+05	4.050e-03	2.057e-02	6.670e-06	3.387e-05
0.2	2.856e+06	7.781e-02	3.277e-01	1.373e-04	5.783e-04
0.3	1.348e+06	6.372e-02	2.136e-01	1.209e-04	4.052e-04
0.4	1.194e+05	8.372e-03	2.426e-02	1.631e-05	4.726e-05
0.5	7.119e+05	6.789e-02	1.776e-01	1.333e-04	3.486e-04
0.6	1.675e+06	2.057e-01	4.977e-01	4.016e-04	9.714e-04
0.8	9.162e+05	1.682e-01	3.631e-01	3.200e-04	6.906e-04
1.0	2.994e+06	7.529e-01	1.506e+00	1.388e-03	2.775e-03
1.5	5.251e+05	2.343e-01	4.137e-01	3.942e-04	6.961e-04
2.0	5.535e+03	3.694e-03	6.056e-03	5.712e-06	9.364e-06
3.0	1.889e+06	2.196e+00	3.289e+00	2.979e-03	4.462e-03
Totals	**1.982e+07**	**3.802e+00**	**6.964e+00**	**5.941e-03**	**1.122e-02**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

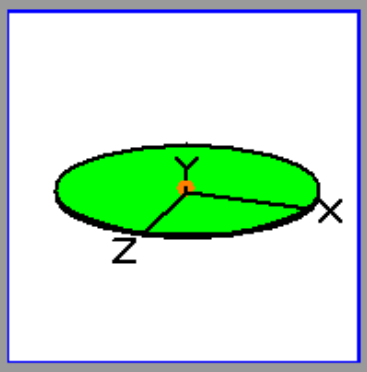
Filename	Run Date	Run Time	Duration
U-238+D SU3 Bounded Area.msd	December 10, 2010	4:11:24 PM	00:00:00

Project Info	
Case Title	U-238+D SU3
Description	SU3 FSS Bounded Area = 118.5 m^2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	614.0 cm (20 ft 1.7 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.78e+07 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Pa-234m	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Th-234	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
U-238	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.939e+05	2.222e-05	2.664e-05	1.906e-06	2.285e-06
0.06	2.055e+05	7.701e-04	4.511e-03	1.530e-06	8.959e-06
0.08	7.465e+03	5.117e-05	3.343e-04	8.097e-08	5.290e-07

0.1	3.179e+05	3.198e-03	1.989e-02	4.893e-06	3.043e-05
0.8	1.087e+04	1.996e-03	4.307e-03	3.796e-06	8.192e-06
1.0	5.064e+04	1.273e-02	2.547e-02	2.347e-05	4.694e-05
Totals	**1.586e+06**	**1.877e-02**	**5.454e-02**	**3.568e-05**	**9.734e-05**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

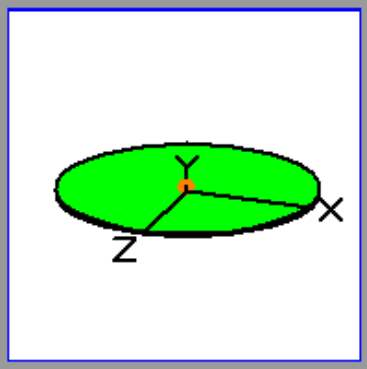
Filename	Run Date	Run Time	Duration
U-234 SU3 Bounded Area.msd	December 10, 2010	4:12:04 PM	00:00:00

Project Info	
Case Title	U-234 SU3
Description	SU3 FSS Bounded Area = 118.5 m^2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	614.0 cm (20 ft 1.7 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.78e+07 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
U-234	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.523e+05	1.235e-05	1.480e-05	1.059e-06	1.270e-06
0.05	6.205e+03	1.457e-05	7.016e-05	3.881e-08	1.869e-07
0.1	2.106e+03	2.119e-05	1.318e-04	3.242e-08	2.016e-07
Totals	**5.606e+05**	**4.811e-05**	**2.168e-04**	**1.130e-06**	**1.658e-06**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

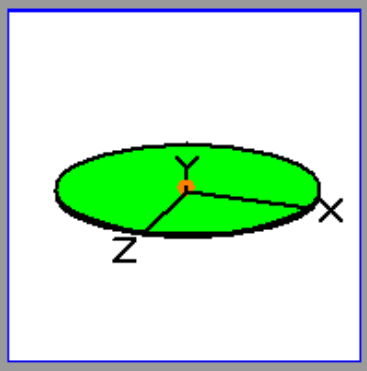
Filename	Run Date	Run Time	Duration
Th-230 SU3 Bounded Area.msd	December 10, 2010	4:12:33 PM	00:00:00

Project Info	
Case Title	Th-230 SU3
Description	SU3 FSS Bounded Area = 118.5 m^2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	614.0 cm (20 ft 1.7 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.78e+07 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Th-230	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.433e+05	9.910e-06	1.188e-05	8.500e-07	1.019e-06
0.06	1.961e+04	7.349e-05	4.304e-04	1.460e-07	8.550e-07
0.15	3.624e+03	6.641e-05	3.372e-04	1.094e-07	5.554e-07
Totals	**4.665e+05**	**1.498e-04**	**7.796e-04**	**1.105e-06**	**2.430e-06**

MicroShield 8.01
Duratek, Inc. (8.00-0000)

Date	By	Checked

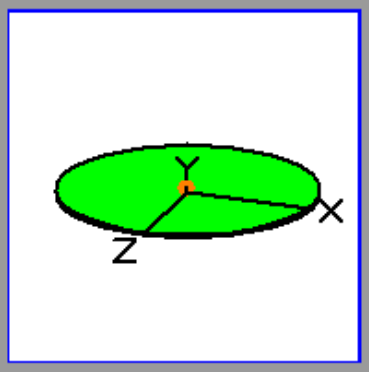
Filename	Run Date	Run Time	Duration
Ra-226+C SU3 Bounded Area.msd	December 10, 2010	4:12:59 PM	00:00:00

Project Info	
Case Title	Ra-226+C SU3
Description	SU3 FSS Bounded Area = 118.5 m^2
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	614.0 cm (20 ft 1.7 in)

Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.78e+07 cm³	Concrete	1.6
Air Gap		Air	0.00122



Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Bi-210	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Bi-214	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Pb-210	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Pb-214	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Po-210	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Po-214	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Po-218	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Ra-226	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001
Rn-222	1.4212e-004	5.2586e+006	8.0000e-006	2.9600e-001

Buildup: The material reference is Air Gap
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.059e+06	4.603e-05	5.519e-05	3.948e-06	4.734e-06
0.05	2.711e+05	6.365e-04	3.065e-03	1.696e-06	8.166e-06
0.08	1.212e+06	8.309e-03	5.429e-02	1.315e-05	8.591e-05
0.1	7.137e+03	7.180e-05	4.466e-04	1.099e-07	6.832e-07
0.2	5.664e+05	1.543e-02	6.497e-02	2.723e-05	1.147e-04
0.3	1.085e+06	5.131e-02	1.720e-01	9.733e-05	3.263e-04
0.4	2.012e+06	1.410e-01	4.086e-01	2.748e-04	7.962e-04
0.5	9.394e+04	8.958e-03	2.343e-02	1.758e-05	4.599e-05
0.6	2.535e+06	3.114e-01	7.533e-01	6.078e-04	1.470e-03
0.8	4.970e+05	9.126e-02	1.969e-01	1.736e-04	3.746e-04
1.0	1.646e+06	4.140e-01	8.280e-01	7.632e-04	1.526e-03
1.5	1.001e+06	4.466e-01	7.888e-01	7.515e-04	1.327e-03
2.0	1.407e+06	9.391e-01	1.540e+00	1.452e-03	2.381e-03
Totals	**1.439e+07**	**2.428e+00**	**4.833e+00**	**4.184e-03**	**8.462e-03**