



CALCULATION COVER SHEET

TH230-03-94-

CALC NO 14-01-00 DISCIPLINE REG COMPLIANCE NO. OF SHEETS 4

PROJECT: EVALUATION OF GENERIC PROTOCOL FOR TH-230 CLEANUP/VERIFICATION AT UMTRA PROJECT SITES USING THE RESRAD COMPUTER CODE

SITE: TH-230 CLEANUP PROTOCOL

FEATURE: AMAD ADJUSTMENT TO COMMITTED DOSE (H₅₀) PER UNIT INTAKE (20um)

SOURCES OF DATA:
 RESRAD COMPUTER CODE
 ICRP-30 - PART 1 INCLUDING ADDENDUM
 ICRP-30 - SUPPLEMENT TO PART 1

SOURCES OF FORMULAE & REFERENCES:
 ICRP-30 - PART 1 INCLUDING ADDENDUM
 ICRP-30 - SUPPLEMENT TO PART 1
 GENERIC PROTOCOL FOR TH-230 CLEANUP/VERIFICATION AT UMTRA SITES.

PRELIMINARY CALC. FINAL CALC. SUPERSEDES CALC. NO. _____

0	AMAD ADJUSTMENT	JH/LKO	2/25/94	W/Rouls	3/3/94	Mark Mills	3/2/94
	940330025B PDR WASTE WM-39	940329 PDR					

REV. NO.	REVISION	CALCULATION BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
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AMAD ADJUSTMENT TO COMMITTED DOSE (H_{50}) PER UNIT INTAKE ($20 \mu\text{m}$)

ICRP-50, PART 2 INCLUDING ADDENDUM - LIMITS
FOR INTAKES OF RADIONUCLIDES BY WORKERS
SECTION 5.5 - H_{50} FOR AN AEROSOL OF AMAD
OTHER THAN $1 \mu\text{m}$ - FORMULA PROVIDED ON P. 29

$$\frac{H_{50}(\text{AMAD})}{H_{50}(1\mu\text{m})} = \int_{\text{N-P}} \frac{D_{\text{N-P}}(\text{AMAD})}{D_{\text{N-P}}(1\mu\text{m})} + \int_{\text{T-B}} \frac{D_{\text{T-B}}(\text{AMAD})}{D_{\text{T-B}}(1\mu\text{m})} + \int_{\text{P}} \frac{D_{\text{P}}(\text{AMAD})}{D_{\text{P}}(1\mu\text{m})} \quad (1)$$

f = FRACTION OF THE COMMITTED DOSE
EQUIV. IN THE REFERENCE TISSUE
RESULTING FROM DEPOSITION IN
THE N-P, T-B, AND P REGIONS
RESPECTIVELY.

D = DEPOSITION PROBABILITIES IN THE
RESPIRATORY REGIONS FOR A GIVEN
AMAD.

$H_{50}(\text{AMAD})$ - COMMITTED DOSE EQUIVALENT FOR
AN AEROSOL OF AMAD OTHER
THAN $1 \mu\text{m}$.

FROM ICRP-30, SUPPLEMENT TO PART 1, VOL. 3,
No. 1-4, 1979 - LIMITS FOR INTAKES OF RADIONUCLIDES
BY WORKERS

COMMITTED DOSE EQUIV. IN TARGET ORGANS/TISSUES
PER INTAKE OF UNIT ACTIVITY (Sv/Bq) OF TH-230

FOR CLASS Y H_{50} (1 μ m)

R. MARROW	$7E-5$ Sv/Bq	(6, 2, 92)
LUNGS	$3E-4$ Sv/Bq	(0, 0, 100)
BONE SURFACE	$8.7E-4$ Sv/Bq	(6, 2, 92)

WHERE ($\#_1, \#_2, \#_3$) = REFERS TO FRACTIONS
IN (f_{N-P}, f_{T-B}, f_P)

THE NON-STOCHASTIC BONE SURFACE LIMIT (0.5 Sv)
IS THE LIMITING VALUE FOR INHALATION FOR CLASS Y
TH-230 1 μ m - AMAD AEROSOLS

SINCE A LARGER PARTICLE SIZE OF 20 μ m AMAD
REFLECTS ACTUAL EXPECTED SITE CONDITIONS, THE
COMMITTED DOSE EQUIV. WAS RECALCULATED USING
EQ. (1)

$$\frac{H_{50} (20 \mu\text{m AMAD})}{8.7E-4 \text{ Sv/Bq}} = \left(\frac{f_{N-P}}{0.06} \right) \left(\frac{0.95}{0.50} \right) + \left(\frac{f_{T-B}}{0.02} \right) \left(\frac{0.03}{0.08} \right) + \left(\frac{f_P}{0.92} \right) \left(\frac{0.02}{0.25} \right)$$

$$\begin{aligned} H_{50} (20 \mu\text{m AMAD}) &= (8.7E-4 \text{ Sv/Bq}) (0.19 + 0.008 + 0.074) \\ &= (8.7E-4 \text{ Sv/Bq}) (0.272) \\ &= 2.4E-4 \text{ Sv/Bq} \end{aligned}$$

IN ADDITION, ICRP-30 STATES THAT FOR AN UNUSUAL DISTRIBUTION WITH AN AMAD OF $> 20 \mu\text{m}$, COMPLETE DEPOSITION IN THE N-P REGION IS EXPECTED. THEREFORE

$$\begin{aligned} H_{50} (> 20 \mu\text{m AMAD}) &= 8.7 \times 10^{-4} \text{ Sv/Bq} \left[0.06 \left(\frac{1.0}{0.3} \right) \right] \\ &= 8.7 \times 10^{-4} \text{ Sv/Bq} [0.20] \\ &= 1.7 \times 10^{-4} \text{ Sv/Bq} \end{aligned}$$

THEREFORE AN INDIVIDUAL COULD BE EXPOSED TO A CONCENTRATION APPROX 3.5 \rightarrow 5.0 LARGER FOR $20 \mu\text{m AMAD}$ PARTICULATES. THEREFORE THE ADJUSTED ALI WOULD INCREASE PRIOR TO REACHING THE NON-STOCHASTIC LIMIT FOR INHALATION.

$$ALI_{\text{NON-STOCH}} = \frac{0.5 \text{ Sv}}{2.4 \times 10^{-4} \text{ Sv/Bq}} = 2083 \text{ Bq FOR } 20 \mu\text{m AMAD}$$

$$ALI_{\text{NON-STOCH}} = \frac{0.5 \text{ Sv}}{1.7 \times 10^{-4} \text{ Sv/Bq}} = 2941 \text{ Bq FOR } > 20 \mu\text{m AMAD}$$

WHEN COMPARED TO THE $1 \mu\text{m AMAD}$ ALI FOR NON-STOCH. \Rightarrow 600 Bq

THE $20 \mu\text{m AMAD}$ CORRECTION IS 3.5 \rightarrow 5.0 LARGER.

2/28/94

CALCULATION COVER SHEET

TH230-03-94-

CALC NO. 14-01-00 DISCIPLINE REG COMPLIANCE NO. OF SHEETS 2

PROJECT: EVALUATION OF GENERIC PROTOCOL FOR TH-230 CLEANUP/VERIFICATION AT UMTRA PROJECT SITES USING THE RESRAD COMPUTER CODE

SITE: TH-230 CLEANUP PROTOCOL

FEATURE:

CALCULATION OF INHALATION DOSE CONVERSION FACTOR FOR TH-230 AT 20um-AMAD.

SOURCES OF DATA:

RESRAD COMPUTER CODE
 ICRP-30 - PART 1 INCLUDING ADDENDUM
 ICRP-30 - SUPPLEMENT TO PART 1

SOURCES OF FORMULAE & REFERENCES:

ICRP-30 - PART 1 INCLUDING ADDENDUM
 ICRP-30 - SUPPLEMENT TO PART 1
 GENERIC PROTOCOL FOR TH-230 CLEANUP/VERIFICATION AT UMTRA SITES.

PRELIMINARY CALC. FINAL CALC. SUPERSEDES CALC. NO. _____

0	DCF - 20 AMAD	JH/LKD/gms	2/28/94	WR/James	3/3/94	Mark Smith	3/2/94
REV. NO.	REVISION	CALCULATION BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

To: File

Date: February 28, 1994

From: J. Hylko *JH*

Subject: Calculation of Inhalation Dose Conversion Factor for Th-230 @ 20- μ m AMAD

I telephoned the author of the RESRAD code, Dr. Charlie Yu of Argonne National Laboratory, on Thursday, February 17, 1994. Dr. Yu returned my call on Friday, February 18, 1994. My question was in regards to changing the 1- μ m AMAD default value in the RESRAD computer code to reflect actual expected AMADs of 20 μ m at the UMTRA Project sites. Current Dose Conversion Factors (DCFs) for inhalation (mrem/pCi) of the various radionuclides at 1- μ m AMAD, particularly Th-230, are listed on page 2, section B-1 in the RESRAD output. Dr. Yu indicated that we must change the DCFs for inhalation of the particular nuclide; again, in this case, Th-230.

The method used to calculate particle size corrections to committed dose equivalent (H_{50}) per intake of unit activity (Sv/Bq) of Th-230 for AMADs other than 1 μ m is given in ICRP-30. The results of these calculations for an AMAD of 20 μ m suggest that there would be a decrease in the DCF for inhalation by a factor of approximately 3.5. Therefore, the Class Y limit for Th-230 given in the RESRAD computer code (0.26 mrem/pCi) was divided by 3.5, giving a new DCF for inhalation for Th-230 (AMAD of 20 μ m) of 0.07 mrem/pCi. This modified DCF was used to generate the data listed in Tables 3 and 4 of the Evaluation of Generic Protocol for Th-230 Cleanup/Verification at UMTRA Project Sites Using the RESRAD Computer Code Position Paper.

COMPARE HALF-LIFE CALCULATIONS
HAND CALCULATION VS. RESRAD COMPUTER CODE

Th-230 $t_{1/2} = 7.7E4 Y$

$$\lambda = \frac{\ln 2}{t_{1/2}} = \frac{0.693}{7.7E4 Y} = 9.0E-6 Y^{-1}$$

THE FORMULA FOR HALF-LIFE DETERMINATION IS

$$A = A_0 e^{-\lambda t} \quad (1)$$

WHERE: A_0 = ORIGINAL VALUE

λ = SEE ABOVE

t = TIME OF DECAY

A = VALUE FOLLOWING TIME FOR DECAY t

AT $t = 0$ USING VALUES FROM TABLE 1
PAGE 17

THE DOSE-TO-SOURCE RATIO (mrem/yr)/(CpCi/g)
GIVES $3.437E-1$

AS A QUICK CHECK OF THE RESRAD COMPUTER CODE, THE RESULTS FOR TH-230 DETERMINED BY RESRAD SHOULD BE EQUIVALENT TO THE HAND CALCULATION USING EQ. (1).

	RESRAD	EQ (1)	% DIFFERENCE
@ t = 0	3.437E-1	3.437E-1	-0-
= 1	3.437E-1	3.437E-1	-0-
= 10	3.437E-1	3.437E-1	-0-
= 100	3.433E-1	3.434E-1	0.03%
= 300	3.425E-1	3.428E-1	0.09%
= 1000	3.397E-1	3.406E-1	0.26%

$$\% \text{ DIFF} = \left| \frac{(\text{RESRAD}) - (\text{EQ 1})}{\text{RESRAD}} \right| \times 100\%$$

THIS CALCULATION DEMONSTRATES THAT THE RESULTS PROVIDED BY THE RESRAD COMPUTER CODE ARE IN AGREEMENT WITH SIMILAR RESULTS OBTAINED VIA HAND CALCULATIONS.

John 2/28/94

Dose Conversion Factor (and Related) Parameter Summary

Menu	Parameter	Current Value	Default	Parameter Name
A-1	Ground external gamma, volume DCF's, (mrem/yr)/(pCi/cm**3):			
A-1	Pb-210+D, soil density = 1.0 g/cm**3	4.870E-03	4.870E-03	DCF1(1,1)
A-1	Pb-210+D, soil density = 1.8 g/cm**3	2.310E-03	2.310E-03	DCF1(1,2)
A-1				
A-1	Ra-226+D, soil density = 1.0 g/cm**3	1.550E+01	1.550E+01	DCF1(2,1)
A-1	Ra-226+D, soil density = 1.8 g/cm**3	8.560E+00	8.560E+00	DCF1(2,2)
A-1				
A-1	Th-230, soil density = 1.0 g/cm**3	2.110E-03	2.110E-03	DCF1(3,1)
A-1	Th-230, soil density = 1.8 g/cm**3	1.030E-03	1.030E-03	DCF1(3,2)
A-3	Depth factors, ground external gamma, dimensionless:			
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = .15 m	8.800E-01	8.800E-01	FD(1,1,1)
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,1)
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,1)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = .15 m	9.700E-01	9.700E-01	FD(1,1,2)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,2)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,2)
A-3				
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = .15 m	6.300E-01	6.300E-01	FD(2,1,1)
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = 0.5 m	9.200E-01	9.200E-01	FD(2,2,1)
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,1)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(2,1,2)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(2,2,2)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,2)
A-3				
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = .15 m	9.300E-01	9.300E-01	FD(3,1,1)
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,1)
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,1)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = .15 m	1.000E+00	1.000E+00	FD(3,1,2)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,2)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.100E-02	2.100E-02	DCF2(1)
B-1	Ra-226+D	7.900E-03	7.900E-03	DCF2(2)
B-1	Th-230	2.600E-01	3.200E-01	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	6.700E-03	6.700E-03	DCF3(1)
D-1	Ra-226+D	1.100E-03	1.100E-03	DCF3(2)
D-1	Th-230	5.300E-04	5.300E-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				

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.8C

Dose Conversion Factor (and Related) Parameter Summary (continued)

Menu	Parameter	Current Value	Default	Parameter Name
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-210D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226D , 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)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.000E+02	3.000E+01	---	BRLD
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	3.000E+03	---	T(9)
R011	Times for calculations (yr)	not used	1.000E+04	---	T(10)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Individual's use of groundwater (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.778E-06	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.663E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.000E+00	2.500E-01	---	FOTD
R017	Shape factor, external gamma	1.000E+00	1.000E+00	---	FS1

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	Outer annular radius (m) = «(1/D)	not used	1.000E+00	---	FRACA(1)
R017	Outer annular radius (m) = «(10/D)	not used	1.000E+00	---	FRACA(2)
R017	Outer annular radius (m) = «(20/D)	not used	1.000E+00	---	FRACA(3)
R017	Outer annular radius (m) = «(50/D)	not used	1.000E+00	---	FRACA(4)
R017	Outer annular radius (m) = «(100/D)	not used	1.000E+00	---	FRACA(5)
R017	Outer annular radius (m) = «(200/D)	not used	1.000E+00	---	FRACA(6)
R017	Outer annular radius (m) = «(500/D)	not used	1.000E+00	---	FRACA(7)
R017	Outer annular radius (m) = «(1000/D)	not used	1.000E+00	---	FRACA(8)
R017	Outer annular radius (m) = «(5000/D)	not used	1.000E+00	---	FRACA(9)
R017	Outer annular radius (m) = «(1.E+04/D)	not used	1.000E+00	---	FRACA(10)
R017	Outer annular radius (m) = «(1.E+05/D)	not used	0.000E+00	---	FRACA(11)
R017	Outer annular radius (m) = «(1.E+06/D)	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	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)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	.1	.1	0.500E-01	FPLANT
R018	Contamination fraction of meat	.1	.1	0.500E-02	FMEAT
R018	Contamination fraction of milk	.1	.1	0.500E-02	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LS1
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	1.000E+00	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
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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
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
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
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	---	PH20CV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH20FL
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	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	2.000E-02	2.000E+00	---	WIND
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	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

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	active

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.8C

Contaminated Zone Dimensions

Initial Soil Concentrations, pCi/g

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Area: 100.00 square meters
Thickness: 2.00 meters
Cover Depth: 0.00 meters

Th-230 1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 100 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

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t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.437E-01	3.482E-01	3.572E-01	3.884E-01	4.758E-01	7.516E-01	1.300E+00	1.951E+00
M(t):	3.437E-03	3.482E-03	3.572E-03	3.884E-03	4.758E-03	7.516E-03	1.300E-02	1.951E-02

Maximum TDOSE(t): 1.951E+00 mrem/yr at t = 1.000E+03 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.112E-03	0.0032	3.360E-01	0.9776	0.000E+00	0.0000	4.636E-03	0.0135	9.508E-06	0.0000	6.780E-07	0.0000	1.935E-03	0.0056
Total	1.112E-03	0.0032	3.360E-01	0.9776	0.000E+00	0.0000	4.636E-03	0.0135	9.508E-06	0.0000	6.780E-07	0.0000	1.935E-03	0.0056

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- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.437E-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	3.437E-01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	4.929E-03	0.0142	3.360E-01	0.9650	5.039E-04	0.0014	4.806E-03	0.0138	1.000E-05	0.0000	1.276E-06	0.0000	1.936E-03	0.0056
Total	4.929E-03	0.0142	3.360E-01	0.9650	5.039E-04	0.0014	4.806E-03	0.0138	1.000E-05	0.0000	1.276E-06	0.0000	1.936E-03	0.0056

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.482E-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	3.482E-01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.253E-02	0.0351	3.360E-01	0.9408	1.507E-03	0.0042	5.166E-03	0.0145	1.107E-05	0.0000	2.504E-06	0.0000	1.941E-03	0.0054
Total	1.253E-02	0.0351	3.360E-01	0.9408	1.507E-03	0.0042	5.166E-03	0.0145	1.107E-05	0.0000	2.504E-06	0.0000	1.941E-03	0.0054

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.572E-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	3.572E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.8C

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	3.880E-02	0.0999	3.360E-01	0.8651	4.972E-03	0.0128	6.621E-03	0.0170	1.547E-05	0.0000	7.099E-06	0.0000	1.966E-03	0.0051
Total	3.880E-02	0.0999	3.360E-01	0.8651	4.972E-03	0.0128	6.621E-03	0.0170	1.547E-05	0.0000	7.099E-06	0.0000	1.966E-03	0.0051

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.884E-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	3.884E-01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.111E-01	0.2335	3.361E-01	0.7065	1.449E-02	0.0304	1.194E-02	0.0251	3.209E-05	0.0001	2.194E-05	0.0000	2.090E-03	0.0044
Total	1.111E-01	0.2335	3.361E-01	0.7065	1.449E-02	0.0304	1.194E-02	0.0251	3.209E-05	0.0001	2.194E-05	0.0000	2.090E-03	0.0044

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.758E-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	4.758E-01	1.0000

*% of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	3.342E-01	0.4447	3.367E-01	0.4480	4.349E-02	0.0579	3.424E-02	0.0456	1.035E-04	0.0001	7.753E-05	0.0001	2.719E-03	0.0036
Total	3.342E-01	0.4447	3.367E-01	0.4480	4.349E-02	0.0579	3.424E-02	0.0456	1.035E-04	0.0001	7.753E-05	0.0001	2.719E-03	0.0036

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	7.516E-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	7.516E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.BC

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	7.748E-01	0.5962	3.378E-01	0.2599	9.902E-02	0.0762	8.328E-02	0.0641	2.616E-04	0.0002	1.957E-04	0.0002	4.171E-03	0.0032
Total	7.748E-01	0.5962	3.378E-01	0.2599	9.902E-02	0.0762	8.328E-02	0.0641	2.616E-04	0.0002	1.957E-04	0.0002	4.171E-03	0.0032

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.300E+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	1.300E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.8C

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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.270E+00	0.6510	3.372E-01	0.1728	1.336E-01	0.0685	1.388E-01	0.0711	4.407E-04	0.0002	3.292E-04	0.0002	5.809E-03	0.0030
Total	1.270E+00	0.6510	3.372E-01	0.1728	1.336E-01	0.0685	1.388E-01	0.0711	4.407E-04	0.0002	3.292E-04	0.0002	5.809E-03	0.0030

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- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	6.406E-02	0.0328	1.158E-04	0.0001	0.000E+00	0.0000	4.944E-04	0.0003	5.754E-06	0.0000	6.538E-06	0.0000	1.951E+00	1.0000
Total	6.406E-02	0.0328	1.158E-04	0.0001	0.000E+00	0.0000	4.944E-04	0.0003	5.754E-06	0.0000	6.538E-06	0.0000	1.951E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g)							
			t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Th-230	Th-230	1.000E+00	3.437E-01	3.437E-01	3.437E-01	3.437E-01	3.436E-01	3.433E-01	3.425E-01	3.397E-01
Th-230	Ra-226	1.000E+00	0.000E+00	4.494E-03	1.344E-02	4.437E-02	1.294E-01	3.916E-01	9.076E-01	1.472E+00
Th-230	Pb-210	1.000E+00	0.000E+00	4.260E-06	3.745E-05	3.839E-04	2.784E-03	1.664E-02	4.951E-02	1.391E-01
Th-230	DSR(j)		3.437E-01	3.482E-01	3.572E-01	3.884E-01	4.758E-01	7.516E-01	1.300E+00	1.951E+00

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

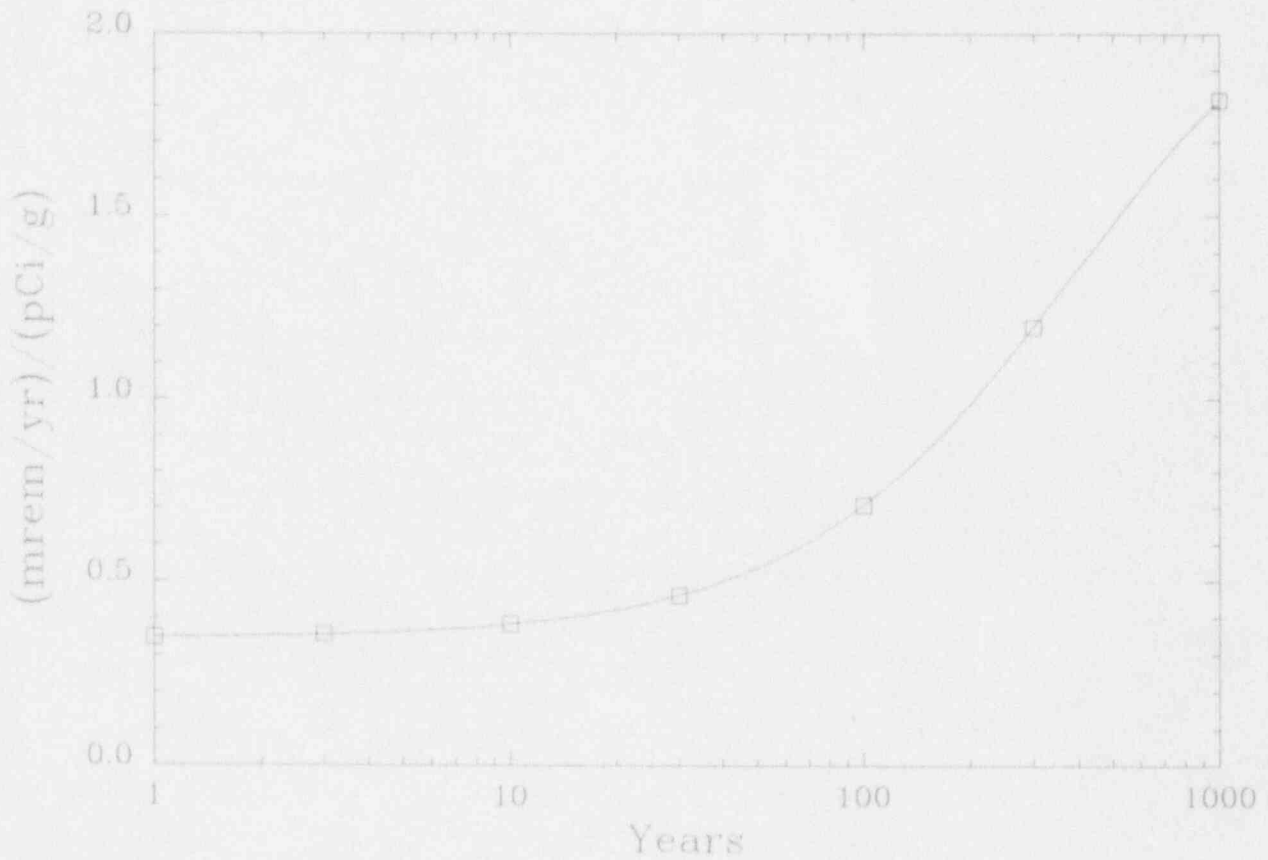
Single Radionuclide Soil Guidelines G(i,t) in pCi/g
 Basic Radiation Dose Limit = 100 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Th-230	2.910E+02	2.872E+02	2.800E+02	2.575E+02	2.102E+02	1.331E+02	7.695E+01	5.125E+01

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)
Th-230	1.000E+00	1.000E+03	1.951E+00	5.125E+01	1.951E+00	5.125E+01

DOSE/SOURCE RATIO: All Pathways Summed, Th-230



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TABLE 2
1 AMAD PARTICLE SIZE
2.0 m/s WIND SPEED

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Part I: Mixture Sums and Single Radionuclide Guidelines

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Dose Conversion Factor: (and Related) Parameter Summary

Menu	Parameter	Current Value	Default	Parameter Name
A-1	Ground external gamma, volume DCF's, (urem/yr)/(pCi/cm**3):			
A-1	Pb-210+D, soil density = 1.0 g/cm**3	4.870E-03	4.870E-03	DCF1(1,1)
A-1	Pb-210+D, soil density = 1.8 g/cm**3	2.310E-03	2.310E-03	DCF1(1,2)
A-1				
A-1	Ra-226+D, soil density = 1.0 g/cm**3	1.550E+01	1.550E+01	DCF1(2,1)
A-1	Ra-226+D, soil density = 1.8 g/cm**3	8.560E+00	8.560E+00	DCF1(2,2)
A-1				
A-1	Th-230, soil density = 1.0 g/cm**3	2.110E-03	2.110E-03	DCF1(3,1)
A-1	Th-230, soil density = 1.8 g/cm**3	1.030E-03	1.030E-03	DCF1(3,2)
A-3	Depth factors, ground external gamma, dimensionless:			
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = .15 m	8.800E-01	8.800E-01	FD(1,1,1)
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,1)
A-3	Pb-210+D, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,1)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = .15 m	9.700E-01	9.700E-01	FD(1,1,2)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(1,2,2)
A-3	Pb-210+D, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(1,3,2)
A-3				
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = .15 m	6.300E-01	6.300E-01	FD(2,1,1)
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = 0.5 m	9.200E-01	9.200E-01	FD(2,2,1)
A-3	Ra-226+D, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,1)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = .15 m	8.500E-01	8.500E-01	FD(2,1,2)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(2,2,2)
A-3	Ra-226+D, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(2,3,2)
A-3				
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = .15 m	9.300E-01	9.300E-01	FD(3,1,1)
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,1)
A-3	Th-230, soil density = 1.0 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,1)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = .15 m	1.000E+00	1.000E+00	FD(3,1,2)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = 0.5 m	1.000E+00	1.000E+00	FD(3,2,2)
A-3	Th-230, soil density = 1.8 g/cm**3, thickness = 1.0 m	1.000E+00	1.000E+00	FD(3,3,2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.100E-02	2.100E-02	DCF2(1)
B-1	Ra-226+D	7.900E-03	7.900E-03	DCF2(2)
B-1	Th-230	2.600E-01	3.200E-01	DCF2(3)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	6.700E-03	6.700E-03	DCF3(1)
D-1	Ra-226+D	1.100E-03	1.100E-03	DCF3(2)
D-1	Th-230	5.300E-04	5.300E-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				

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

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Dose Conversion Factor (and Related) Parameter Summary (continued)

Menu	Parameter	Current Value	Default	Parameter Name
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+0 , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+0 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+0 , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+0 , 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)

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

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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)	1.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.000E+02	3.000E+01	---	BRLD
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	T1
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	3.000E+03	---	T(9)
R011	Times for calculations (yr)	not used	1.000E+04	---	T(10)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+00	0.000E+00	---	S1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIRWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Individual's use of groundwater (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

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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	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(3)
R016	Unsat. zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.778E-06	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsat. zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.663E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsat. zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.000E+00	2.500E-01	---	FOTD
R017	Shape factor, external gamma	1.000E+00	1.000E+00	---	FS1

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

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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	Outer annular radius (m) = $\kappa(1/D)$	not used	1.000E+00	---	FRACA(1)
R017	Outer annular radius (m) = $\kappa(10/D)$	not used	1.000E+00	---	FRACA(2)
R017	Outer annular radius (m) = $\kappa(20/D)$	not used	1.000E+00	---	FRACA(3)
R017	Outer annular radius (m) = $\kappa(50/D)$	not used	1.000E+00	---	FRACA(4)
R017	Outer annular radius (m) = $\kappa(100/D)$	not used	1.000E+00	---	FRACA(5)
R017	Outer annular radius (m) = $\kappa(200/D)$	not used	1.000E+00	---	FRACA(6)
R017	Outer annular radius (m) = $\kappa(500/D)$	not used	1.000E+00	---	FRACA(7)
R017	Outer annular radius (m) = $\kappa(1000/D)$	not used	1.000E+00	---	FRACA(8)
R017	Outer annular radius (m) = $\kappa(5000/D)$	not used	1.000E+00	---	FRACA(9)
R017	Outer annular radius (m) = $\kappa(1.E+04/D)$	not used	1.000E+00	---	FRACA(10)
R017	Outer annular radius (m) = $\kappa(1.E+05/D)$	not used	0.000E+00	---	FRACA(11)
R017	Outer annular radius (m) = $\kappa(1.E+06/D)$	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	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)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E-01	FPLANT
R018	Contamination fraction of meat	-1	-1	0.500E-02	FMEAT
R018	Contamination fraction of milk	-1	-1	0.500E-02	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LS1
R019	Mass loading for foliar deposition ($\mu\text{g}/\text{m}^2\cdot\text{yr}$)	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	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
C14	C-12 concentration in water ($\mu\text{g}/\text{cm}^3$)	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	---	EVS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (if different from user input)	Parameter Name
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	---	AVF05
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
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	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
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	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

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	active

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

Contaminated Zone Dimensions ~~~~~ Area: 100.00 square meters Thickness: 2.00 meters Cover Depth: 0.00 meters	Initial Soil Concentrations, pCi/g ~~~~~ Th-230 1.000E+00
--	--

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 100 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

~~~~~

|            |           |           |           |           |           |           |           |           |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| t (years): | 0.000E+00 | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| TDOSE(t):  | 3.437E-01 | 3.477E-01 | 3.557E-01 | 3.834E-01 | 4.613E-01 | 7.081E-01 | 1.201E+00 | 1.818E+00 |
| M(t):      | 3.437E-03 | 3.477E-03 | 3.557E-03 | 3.834E-03 | 4.613E-03 | 7.081E-03 | 1.201E-02 | 1.818E-02 |

Maximum TDOSE(t): 1.813E+00 mrem/yr    at t = 1.000E+03 years

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.112E-03 | 0.0032 | 3.360E-01  | 0.9776 | 0.000E+00 | 0.0000 | 4.636E-03 | 0.0135 | 9.508E-06 | 0.0000 | 6.780E-07 | 0.0000 | 1.935E-03 | 0.0056 |
| Total             | 1.112E-03 | 0.0032 | 3.360E-01  | 0.9776 | 0.000E+00 | 0.0000 | 4.636E-03 | 0.0135 | 9.508E-06 | 0.0000 | 6.780E-07 | 0.0000 | 1.935E-03 | 0.0056 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 3.437E-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 | 3.437E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 4.929E-03 | 0.0142 | 3.360E-01  | 0.9664 | 5.663E-08 | 0.0000 | 4.806E-03 | 0.0138 | 1.000E-05 | 0.0000 | 1.276E-06 | 0.0000 | 1.936E-03 | 0.0056 |
| Total             | 4.929E-03 | 0.0142 | 3.360E-01  | 0.9664 | 5.663E-08 | 0.0000 | 4.806E-03 | 0.0138 | 1.000E-05 | 0.0000 | 1.276E-06 | 0.0000 | 1.936E-03 | 0.0056 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 3.477E-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 | 3.477E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.253E-02 | 0.0352 | 3.360E-01  | 0.9447 | 1.694E-07 | 0.0000 | 5.166E-03 | 0.0145 | 1.107E-05 | 0.0000 | 2.504E-06 | 0.0000 | 1.941E-03 | 0.0055 |
| Total             | 1.253E-02 | 0.0352 | 3.360E-01  | 0.9447 | 1.694E-07 | 0.0000 | 5.166E-03 | 0.0145 | 1.107E-05 | 0.0000 | 2.504E-06 | 0.0000 | 1.941E-03 | 0.0055 |

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

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 3.557E-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 | 3.557E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 3.880E-02 | 0.1012 | 3.360E-01  | 0.8763 | 5.589E-07 | 0.0000 | 6.621E-03 | 0.0173 | 1.547E-05 | 0.0000 | 7.099E-06 | 0.0000 | 1.966E-03 | 0.0051 |
| Total             | 3.880E-02 | 0.1012 | 3.360E-01  | 0.8763 | 5.589E-07 | 0.0000 | 6.621E-03 | 0.0173 | 1.547E-05 | 0.0000 | 7.099E-06 | 0.0000 | 1.966E-03 | 0.0051 |

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

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 3.834E-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 | 3.834E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.



Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.111E-01 | 0.2408 | 3.361E-01  | 0.7287 | 1.628E-06 | 0.0000 | 1.194E-02 | 0.0259 | 3.209E-05 | 0.0001 | 2.194E-05 | 0.0000 | 2.090E-03 | 0.0045 |
| Total             | 1.111E-01 | 0.2408 | 3.361E-01  | 0.7287 | 1.628E-06 | 0.0000 | 1.194E-02 | 0.0259 | 3.209E-05 | 0.0001 | 2.194E-05 | 0.0000 | 2.090E-03 | 0.0045 |

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

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 4.613E-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 | 4.613E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 3.342E-01 | 0.4720 | 3.367E-01  | 0.4755 | 4.888E-06 | 0.0000 | 3.424E-02 | 0.0484 | 1.035E-04 | 0.0001 | 7.753E-05 | 0.0001 | 2.719E-03 | 0.0038 |
| Total             | 3.342E-01 | 0.4720 | 3.367E-01  | 0.4755 | 4.888E-06 | 0.0000 | 3.424E-02 | 0.0484 | 1.035E-04 | 0.0001 | 7.753E-05 | 0.0001 | 2.719E-03 | 0.0038 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 7.081E-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 | 7.081E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 7.748E-01 | 0.6454 | 3.378E-01  | 0.2814 | 1.113E-05 | 0.0000 | 8.328E-02 | 0.0694 | 2.616E-04 | 0.0002 | 1.957E-04 | 0.0002 | 4.171E-03 | 0.0035 |
| Total             | 7.748E-01 | 0.6454 | 3.378E-01  | 0.2814 | 1.113E-05 | 0.0000 | 8.328E-02 | 0.0694 | 2.616E-04 | 0.0002 | 1.957E-04 | 0.0002 | 4.171E-03 | 0.0035 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 1.201E+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 | 1.201E+00     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.270E+00 | 0.6989 | 3.372E-01  | 0.1855 | 1.502E-05 | 0.0000 | 1.388E-01 | 0.0764 | 4.407E-04 | 0.0002 | 3.292E-04 | 0.0002 | 5.809E-03 | 0.0032 |
| Total             | 1.270E+00 | 0.6989 | 3.372E-01  | 0.1855 | 1.502E-05 | 0.0000 | 1.388E-01 | 0.0764 | 4.407E-04 | 0.0002 | 3.292E-04 | 0.0002 | 5.809E-03 | 0.0032 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| Th-230            | 6.406E-02 | 0.0352 | 1.158E-04 | 0.0001 | 0.000E+00 | 0.0000 | 4.944E-04 | 0.0003 | 5.754E-06 | 0.0000 | 6.538E-06 | 0.0000 | 1.818E+00     | 1.0000 |
| Total             | 6.406E-02 | 0.0352 | 1.158E-04 | 0.0001 | 0.000E+00 | 0.0000 | 4.944E-04 | 0.0003 | 5.754E-06 | 0.0000 | 6.538E-06 | 0.0000 | 1.818E+00     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7C

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

| Parent (i) | Product (j) | Branch Fraction | DSR(j,t) (mrem/yr)/(pCi/g) |           |           |           |           |           |           |           |
|------------|-------------|-----------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|            |             |                 | t= 0.000E+00               | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| Th-230     | Th-230      | 1.000E+00       | 3.437E-01                  | 3.437E-01 | 3.437E-01 | 3.437E-01 | 3.436E-01 | 3.433E-01 | 3.425E-01 | 3.397E-01 |
| Th-230     | Ra-226      | 1.000E+00       | 0.000E+00                  | 3.990E-03 | 1.194E-02 | 3.940E-02 | 1.149E-01 | 3.482E-01 | 8.086E-01 | 1.339E+00 |
| Th-230     | Pb-210      | 1.000E+00       | 0.000E+00                  | 4.260E-06 | 3.745E-05 | 3.839E-04 | 2.784E-03 | 1.664E-02 | 4.951E-02 | 1.391E-01 |
| Th-230     | DSR(j)      |                 | 3.437E-01                  | 3.477E-01 | 3.557E-01 | 3.834E-01 | 4.613E-01 | 7.081E-01 | 1.201E+00 | 1.818E+00 |

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

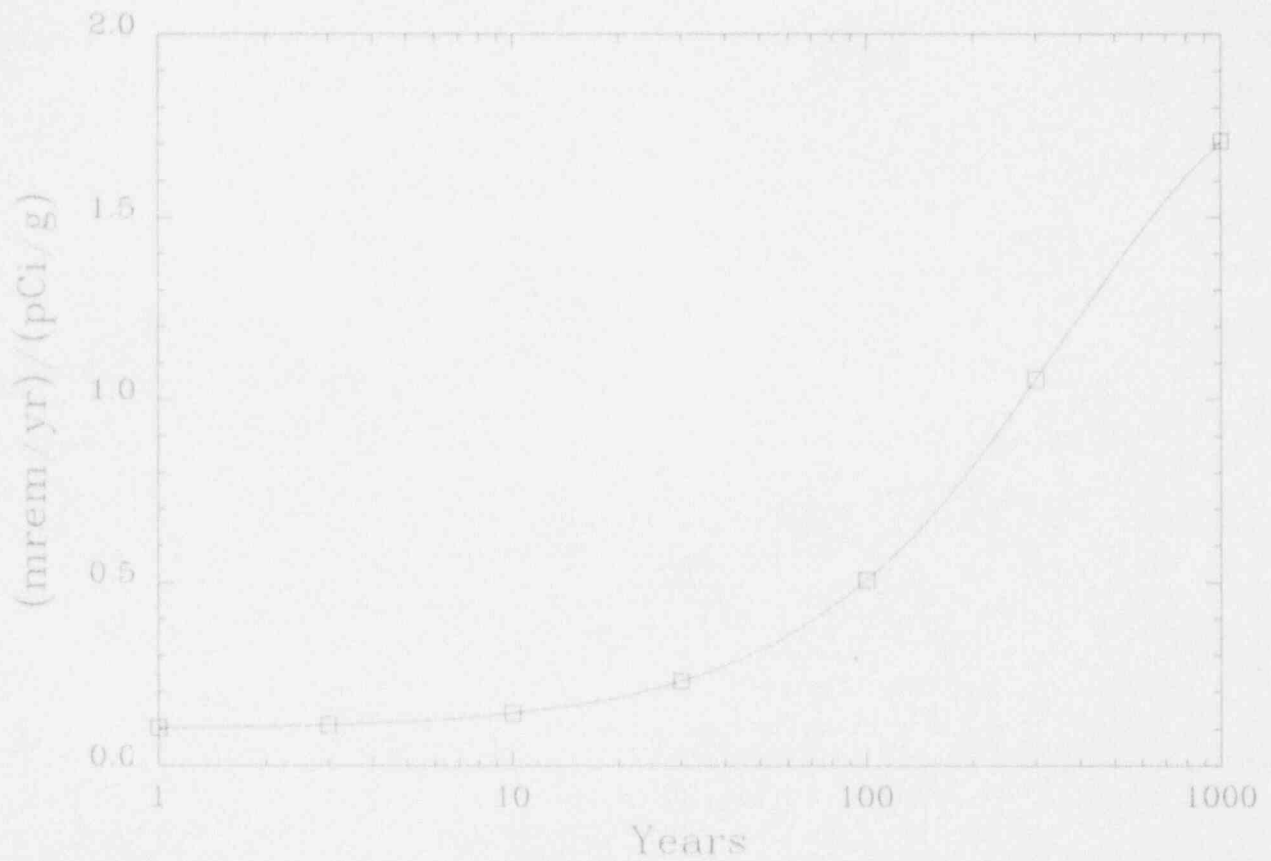
Single Radionuclide Soil Guidelines G(i,t) in pCi/g  
Basic Radiation Dose Limit = 100 mrem/yr

| Nuclide (i) | t= 0.000E+00 | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
|-------------|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Th-230      | 2.910E+02    | 2.876E+02 | 2.812E+02 | 2.608E+02 | 2.168E+02 | 1.412E+02 | 8.329E+01 | 5.502E+01 |

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) |
|-------------|---------------|--------------|-------------|-------------------|-------------|-------------------|
| Th-230      | 1.000E+00     | 1.000E+03    | 1.818E+00   | 5.502E+01         | 1.818E+00   | 5.502E+01         |

DOSE/SOURCE RATIO: All Pathways Summed, Th-230



CLEAN.8D

02/25/94 09:23

TABLE 3  
20 AMAD PARTICLE SIZE  
0.02 M/S WIND SPEED

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#####

Part I: Mixture Sums and Single Radionuclide Guidelines

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Dose Conversion Factor (and Related) Parameter Summary

| Menu | Parameter                                                   | Current Value | Default   | Parameter Name |
|------|-------------------------------------------------------------|---------------|-----------|----------------|
| A-1  | Ground external gamma, volume DCF's, (mrem/yr)/(pCi/cm**3): |               |           |                |
| A-1  | Pb-210+D, soil density = 1.0 g/cm**3                        | 4.870E-03     | 4.870E-03 | DCF1( 1,1)     |
| A-1  | Pb-210+D, soil density = 1.8 g/cm**3                        | 2.310E-03     | 2.310E-03 | DCF1( 1,2)     |
| A-1  |                                                             |               |           |                |
| A-1  | Ra-226+D, soil density = 1.0 g/cm**3                        | 1.550E+01     | 1.550E+01 | DCF1( 2,1)     |
| A-1  | Ra-226+D, soil density = 1.8 g/cm**3                        | 8.560E+00     | 8.560E+00 | DCF1( 2,2)     |
| A-1  |                                                             |               |           |                |
| A-1  | Th-230, soil density = 1.0 g/cm**3                          | 2.110E-03     | 2.110E-03 | DCF1( 3,1)     |
| A-1  | Th-230, soil density = 1.8 g/cm**3                          | 1.030E-03     | 1.030E-03 | DCF1( 3,2)     |
| A-3  | Depth factors, ground external gamma, dimensionless:        |               |           |                |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = .15 m     | 8.800E-01     | 8.800E-01 | FD( 1,1,1)     |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 1,2,1)     |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 1,3,1)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = .15 m     | 9.700E-01     | 9.700E-01 | FD( 1,1,2)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 1,2,2)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 1,3,2)     |
| A-3  |                                                             |               |           |                |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = .15 m     | 6.300E-01     | 6.300E-01 | FD( 2,1,1)     |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = 0.5 m     | 9.200E-01     | 9.200E-01 | FD( 2,2,1)     |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 2,3,1)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = .15 m     | 8.500E-01     | 8.500E-01 | FD( 2,1,2)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 2,2,2)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 2,3,2)     |
| A-3  |                                                             |               |           |                |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = .15 m       | 9.300E-01     | 9.300E-01 | FD( 3,1,1)     |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = 0.5 m       | 1.000E+00     | 1.000E+00 | FD( 3,2,1)     |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = 1.0 m       | 1.000E+00     | 1.000E+00 | FD( 3,3,1)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = .15 m       | 1.000E+00     | 1.000E+00 | FD( 3,1,2)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = 0.5 m       | 1.000E+00     | 1.000E+00 | FD( 3,2,2)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = 1.0 m       | 1.000E+00     | 1.000E+00 | FD( 3,3,2)     |
| B-1  | Dose conversion factors for inhalation, mrem/pCi:           |               |           |                |
| B-1  | Pb-210+D                                                    | 2.100E-02     | 2.100E-02 | DCF2( 1)       |
| B-1  | Ra-226+D                                                    | 7.900E-03     | 7.900E-03 | DCF2( 2)       |
| B-1  | Th-230                                                      | 7.000E-02     | 3.200E-01 | DCF2( 3)       |
| D-1  | Dose conversion factors for ingestion, mrem/pCi:            |               |           |                |
| D-1  | Pb-210+D                                                    | 6.700E-03     | 6.700E-03 | DCF3( 1)       |
| D-1  | Ra-226+D                                                    | 1.100E-03     | 1.100E-03 | DCF3( 2)       |
| D-1  | Th-230                                                      | 5.300E-04     | 5.300E-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 |                                                             |               |           |                |



Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.BD

Dose Conversion Factor (and Related) Parameter Summary (continued)

| Menu | Parameter                                              | Current Value | Default   | Parameter Name |
|------|--------------------------------------------------------|---------------|-----------|----------------|
| 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)   |

Site-Specific Parameter Summary

| Menu | Parameter                                       | User Input | Default   | Used by RESRAD<br>(if different from user input) | Parameter Name |
|------|-------------------------------------------------|------------|-----------|--------------------------------------------------|----------------|
| R011 | Area of contaminated zone (m**2)                | 1.000E+02  | 1.000E+04 | ---                                              | AREA           |
| R011 | Thickness of contaminated zone (m)              | 2.000E+00  | 2.000E+00 | ---                                              | THICKO         |
| R011 | Length parallel to aquifer flow (m)             | 1.000E+02  | 1.000E+02 | ---                                              | LCZPAQ         |
| R011 | Basic radiation dose limit (mrem/yr)            | 1.000E+02  | 3.000E+01 | ---                                              | BRLD           |
| R011 | Time since placement of material (yr)           | 0.000E+00  | 0.000E+00 | ---                                              | TI             |
| R011 | Times for calculations (yr)                     | 1.000E+00  | 1.000E+00 | ---                                              | T( 2)          |
| R011 | Times for calculations (yr)                     | 3.000E+00  | 3.000E+00 | ---                                              | T( 3)          |
| R011 | Times for calculations (yr)                     | 1.000E+01  | 1.000E+01 | ---                                              | T( 4)          |
| R011 | Times for calculations (yr)                     | 3.000E+01  | 3.000E+01 | ---                                              | T( 5)          |
| R011 | Times for calculations (yr)                     | 1.000E+02  | 1.000E+02 | ---                                              | T( 6)          |
| R011 | Times for calculations (yr)                     | 3.000E+02  | 3.000E+02 | ---                                              | T( 7)          |
| R011 | Times for calculations (yr)                     | 1.000E+03  | 1.000E+03 | ---                                              | T( 8)          |
| R011 | Times for calculations (yr)                     | not used   | 3.000E+03 | ---                                              | T( 9)          |
| R011 | Times for calculations (yr)                     | not used   | 1.000E+04 | ---                                              | T(10)          |
| R012 | Initial principal radionuclide (pCi/g): Th-230  | 1.000E+00  | 0.000E+00 | ---                                              | S1( 3)         |
| 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 | ---                                              | COVERD         |
| R013 | Density of cover material (g/cm**3)             | not used   | 1.500E+00 | ---                                              | DENSCV         |
| R013 | Cover depth erosion rate (m/yr)                 | not used   | 1.000E-03 | ---                                              | VCV            |
| R013 | Density of contaminated zone (g/cm**3)          | 1.500E+00  | 1.500E+00 | ---                                              | DENSCZ         |
| R013 | Contaminated zone erosion rate (m/yr)           | 1.000E-03  | 1.000E-03 | ---                                              | VCZ            |
| R013 | Contaminated zone total porosity                | 4.000E-01  | 4.000E-01 | ---                                              | TPCZ           |
| R013 | Contaminated zone effective porosity            | 2.000E-01  | 2.000E-01 | ---                                              | EPCZ           |
| R013 | Contaminated zone hydraulic conductivity (m/yr) | 1.000E+01  | 1.000E+01 | ---                                              | HCCZ           |
| R013 | Contaminated zone b parameter                   | 5.300E+00  | 5.300E+00 | ---                                              | BCZ            |
| R013 | Humidity in air (g/m**3)                        | not used   | 8.000E+00 | ---                                              | HUMID          |
| R013 | Evapotranspiration coefficient                  | 5.000E-01  | 5.000E-01 | ---                                              | EVAPTR         |
| R013 | Precipitation (m/yr)                            | 1.000E+00  | 1.000E+00 | ---                                              | PRECIP         |
| R013 | Irrigation (m/yr)                               | 2.000E-01  | 2.000E-01 | ---                                              | RI             |
| R013 | Irrigation mode                                 | overhead   | overhead  | ---                                              | IDITCH         |
| R013 | Runoff coefficient                              | 2.000E-01  | 2.000E-01 | ---                                              | RUNOFF         |
| R013 | Watershed area for nearby stream or pond (m**2) | 1.000E+06  | 1.000E+06 | ---                                              | WAREA          |
| R013 | Accuracy for water/soil computations            | 1.000E-03  | 1.000E-03 | ---                                              | EPS            |
| R014 | Density of saturated zone (g/cm**3)             | 1.500E+00  | 1.500E+00 | ---                                              | DENSAQ         |
| R014 | Saturated zone total porosity                   | 4.000E-01  | 4.000E-01 | ---                                              | TPSZ           |
| R014 | Saturated zone effective porosity               | 2.000E-01  | 2.000E-01 | ---                                              | EPSZ           |
| R014 | Saturated zone hydraulic conductivity (m/yr)    | 1.000E+02  | 1.000E+02 | ---                                              | HCSZ           |
| R014 | Saturated zone hydraulic gradient               | 2.000E-02  | 2.000E-02 | ---                                              | HGWT           |
| R014 | Saturated zone b parameter                      | 5.300E+00  | 5.300E+00 | ---                                              | BSZ            |
| R014 | Water table drop rate (m/yr)                    | 1.000E-03  | 1.000E-03 | ---                                              | VWT            |
| R014 | Well pump intake depth (m below water table)    | 1.000E+01  | 1.000E+01 | ---                                              | DWIBWT         |
| R014 | Model: Nondispersion (ND) or Mass-Balance (MB)  | ND         | ND        | ---                                              | MODEL          |
| R014 | Individual's use of groundwater (m**3/yr)       | not used   | 2.500E+02 | ---                                              | UW             |
| R015 | Number of unsaturated zone strata               | 1          | 1         | ---                                              | NS             |

Site-Specific Parameter Summary (continued)

| Menu | Parameter                                         | User Input | Default   | Used by RESRAD<br>(if different from user input) | Parameter Name |
|------|---------------------------------------------------|------------|-----------|--------------------------------------------------|----------------|
| R015 | Unsat. zone 1, thickness (m)                      | 4.000E+00  | 4.000E+00 | ---                                              | H(1)           |
| R015 | Unsat. zone 1, soil density (g/cm**3)             | 1.500E+00  | 1.500E+00 | ---                                              | DENSUZ(1)      |
| R015 | Unsat. zone 1, total porosity                     | 4.000E-01  | 4.000E-01 | ---                                              | TPUZ(1)        |
| R015 | Unsat. zone 1, effective porosity                 | 2.000E-01  | 2.000E-01 | ---                                              | EPUZ(1)        |
| R015 | Unsat. zone 1, soil-specific b parameter          | 5.300E+00  | 5.300E+00 | ---                                              | BUZ(1)         |
| R015 | Unsat. zone 1, hydraulic conductivity (m/yr)      | 1.000E+01  | 1.000E+01 | ---                                              | HCUZ(1)        |
| R016 | Distribution coefficients for Th-230              |            |           |                                                  |                |
| R016 | Contaminated zone (cm**3/g)                       | 6.000E+04  | 6.000E+04 | ---                                              | DCNUCC( 3)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 6.000E+04  | 6.000E+04 | ---                                              | DCNUCU( 3,1)   |
| R016 | Saturated zone (cm**3/g)                          | 6.000E+04  | 6.000E+04 | ---                                              | DCNUCS( 3)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 2.778E-06                                        | ALEACH( 3)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                         | SOLUBK( 3)     |
| R016 | Distribution coefficients for daughter Pb-210     |            |           |                                                  |                |
| R016 | Contaminated zone (cm**3/g)                       | 1.000E+02  | 1.000E+02 | ---                                              | DCNUCC( 1)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 1.000E+02  | 1.000E+02 | ---                                              | DCNUCU( 1,1)   |
| R016 | Saturated zone (cm**3/g)                          | 1.000E+02  | 1.000E+02 | ---                                              | DCNUCS( 1)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 1.663E-03                                        | ALEACH( 1)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                         | SOLUBK( 1)     |
| R016 | Distribution coefficients for daughter Ra-226     |            |           |                                                  |                |
| R016 | Contaminated zone (cm**3/g)                       | 7.000E+01  | 7.000E+01 | ---                                              | DCNUCC( 2)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 7.000E+01  | 7.000E+01 | ---                                              | DCNUCU( 2,1)   |
| R016 | Saturated zone (cm**3/g)                          | 7.000E+01  | 7.000E+01 | ---                                              | DCNUCS( 2)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 2.374E-03                                        | ALEACH( 2)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                         | SOLUBK( 2)     |
| R017 | Inhalation rate (m**3/yr)                         | 8.400E+03  | 8.400E+03 | ---                                              | INHALR         |
| R017 | Mass loading for inhalation (g/m**3)              | 2.000E-04  | 2.000E-04 | ---                                              | MLINH          |
| R017 | Dilution length for airborne dust, inhalation (m) | 3.000E+00  | 3.000E+00 | ---                                              | LM             |
| R017 | Exposure duration                                 | 3.000E+01  | 3.000E+01 | ---                                              | ED             |
| R017 | Shielding factor, inhalation                      | 1.000E+00  | 4.000E-01 | ---                                              | SHF3           |
| R017 | Shielding factor, external gamma                  | 1.000E+00  | 7.000E-01 | ---                                              | SHF1           |
| R017 | Fraction of time spent indoors                    | 0.000E+00  | 5.000E-01 | ---                                              | FIND           |
| R017 | Fraction of time spent outdoors (on site)         | 1.000E+00  | 2.500E-01 | ---                                              | FOTD           |
| R017 | Shape factor, external gamma                      | 1.000E+00  | 1.000E+00 | ---                                              | FS1            |

## 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 | Outer annular radius (m) = «(1/D)                | not used   | 1.000E+00 | ---                                           | FRACA( 1)      |
| R017 | Outer annular radius (m) = «(10/D)               | not used   | 1.000E+00 | ---                                           | FRACA( 2)      |
| R017 | Outer annular radius (m) = «(20/D)               | not used   | 1.000E+00 | ---                                           | FRACA( 3)      |
| R017 | Outer annular radius (m) = «(50/D)               | not used   | 1.000E+00 | ---                                           | FRACA( 4)      |
| R017 | Outer annular radius (m) = «(100/D)              | not used   | 1.000E+00 | ---                                           | FRACA( 5)      |
| R017 | Outer annular radius (m) = «(200/D)              | not used   | 1.000E+00 | ---                                           | FRACA( 6)      |
| R017 | Outer annular radius (m) = «(500/D)              | not used   | 1.000E+00 | ---                                           | FRACA( 7)      |
| R017 | Outer annular radius (m) = «(1000/D)             | not used   | 1.000E+00 | ---                                           | FRACA( 8)      |
| R017 | Outer annular radius (m) = «(5000/D)             | not used   | 1.000E+00 | ---                                           | FRACA( 9)      |
| R017 | Outer annular radius (m) = «(1.E+04/D)           | not used   | 1.000E+00 | ---                                           | FRACA(10)      |
| R017 | Outer annular radius (m) = «(1.E+05/D)           | not used   | 0.000E+00 | ---                                           | FRACA(11)      |
| R017 | Outer annular radius (m) = «(1.E+06/D)           | not used   | 0.000E+00 | ---                                           | FRACA(12)      |
| R018 | Fruits, vegetables and grain consumption (kg/yr) | 1.600E+02  | 1.600E+02 | ---                                           | DIET(1)        |
| R018 | Leafy vegetable consumption (kg/yr)              | 1.400E+01  | 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)             | 6.300E+01  | 6.300E+01 | ---                                           | DIET(4)        |
| R018 | Fish consumption (kg/yr)                         | 5.400E+00  | 5.400E+00 | ---                                           | DIET(5)        |
| R018 | Other seafood consumption (kg/yr)                | 9.000E-01  | 9.000E-01 | ---                                           | DIET(6)        |
| R018 | Soil ingestion rate (g/yr)                       | 3.650E+01  | 3.650E+01 | ---                                           | SOIL           |
| R018 | Drinking water intake (L/yr)                     | 5.100E+02  | 5.100E+02 | ---                                           | DWI            |
| R018 | Contamination fraction of drinking water         | 1.000E+00  | 1.000E+00 | ---                                           | FDW            |
| R018 | Contamination fraction of household water        | 1.000E+00  | 1.000E+00 | ---                                           | FHHW           |
| R018 | Contamination fraction of livestock water        | 1.000E+00  | 1.000E+00 | ---                                           | FLW            |
| R018 | Contamination fraction of irrigation water       | 1.000E+00  | 1.000E+00 | ---                                           | FIRW           |
| R018 | Contamination fraction of aquatic food           | 5.000E-01  | 5.000E-01 | ---                                           | FR9            |
| R018 | Contamination fraction of plant food             | -1         | -1        | 0.500E-01                                     | FPLANT         |
| R018 | Contamination fraction of meat                   | -1         | -1        | 0.500E-02                                     | FMEAT          |
| R018 | Contamination fraction of milk                   | -1         | -1        | 0.500E-02                                     | FMILK          |
| R019 | Livestock fodder intake for meat (kg/day)        | 6.800E+01  | 6.800E+01 | ---                                           | LF15           |
| R019 | Livestock fodder intake for milk (kg/day)        | 5.500E+01  | 5.500E+01 | ---                                           | LF16           |
| R019 | Livestock water intake for meat (L/day)          | 5.000E+01  | 5.000E+01 | ---                                           | LW15           |
| R019 | Livestock water intake for milk (L/day)          | 1.600E+02  | 1.600E+02 | ---                                           | LW16           |
| 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       | 1.000E+00  | 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          |
| 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 | ---                                           | C12C2          |
| 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           |

Site-Specific Parameter Summary (continued)

| Menu | Parameter                                      | User Input | Default   | Used by RESRAD (If different from user input) | Parameter Name |
|------|------------------------------------------------|------------|-----------|-----------------------------------------------|----------------|
| 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          |
| R021 | Thickness of building foundation (m)           | not used   | 1.500E-01 | ---                                           | FLOOR          |
| 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 | ---                                           | PH20CV         |
| R021 | Volumetric water content of the foundation     | not used   | 3.000E-02 | ---                                           | PH20FL         |
| 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                      | 2.000E-06  | 2.000E-06 | ---                                           | DIFCZ          |
| R021 | Radon vertical dimension of mixing (m)         | 2.000E+00  | 2.000E+00 | ---                                           | HMIX           |
| R021 | Average annual wind speed (m/sec)              | 2.000E-02  | 2.000E+00 | ---                                           | WIND           |
| 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 | code computed (time dependent)                | FAI            |
| R021 | Building depth below ground surface (m)        | not used   | 1.000E+00 | ---                                           | DMFL           |
| R021 | Emanating power of Rn-222 gas                  | 2.500E-01  | 2.500E-01 | ---                                           | EMANA(1)       |
| R021 | Emanating power of Rn-220 gas                  | not used   | 1.500E-01 | ---                                           | EMANA(2)       |

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                  | active         |

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.BD

Contaminated Zone Dimensions

aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

Area: 100.00 square meters  
Thickness: 2.00 meters  
Cover Depth: 0.00 meters

Initial Soil Concentrations, pCi/g

aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

Th-230 1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 100 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

|            |           |           |           |           |           |           |           |           |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| t (years): | 0.000E+00 | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| TDOSE(t):  | 9.815E-02 | 1.027E-01 | 1.116E-01 | 1.429E-01 | 2.303E-01 | 5.063E-01 | 1.055E+00 | 1.708E+00 |
| M(t):      | 9.815E-04 | 1.027E-03 | 1.116E-03 | 1.429E-03 | 2.303E-03 | 5.063E-03 | 1.055E-02 | 1.708E-02 |

Maximum TDOSE(t): 1.708E+00 mrem/yr at t = 1.000E+03 years

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.BD

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.112E-03 | 0.0113 | 9.046E-02  | 0.9216 | 0.000E+00 | 0.0000 | 4.636E-03 | 0.0472 | 9.508E-06 | 0.0001 | 6.780E-07 | 0.0000 | 1.935E-03 | 0.0197 |
| Total             | 1.112E-03 | 0.0113 | 9.046E-02  | 0.9216 | 0.000E+00 | 0.0000 | 4.636E-03 | 0.0472 | 9.508E-06 | 0.0001 | 6.780E-07 | 0.0000 | 1.935E-03 | 0.0197 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 9.815E-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 | 9.815E-02     | 1.0000 |

\*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 4.929E-03 | 0.0480 | 9.047E-02  | 0.8813 | 5.039E-04 | 0.0049 | 4.806E-03 | 0.0468 | 1.000E-05 | 0.0001 | 1.276E-06 | 0.0000 | 1.936E-03 | 0.0189 |
| Total             | 4.929E-03 | 0.0480 | 9.047E-02  | 0.8813 | 5.039E-04 | 0.0049 | 4.806E-03 | 0.0468 | 1.000E-05 | 0.0001 | 1.276E-06 | 0.0000 | 1.936E-03 | 0.0189 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 1.027E-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 | 1.027E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.



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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.253E-02 | 0.1123 | 9.047E-02  | 0.8105 | 1.507E-03 | 0.0135 | 5.166E-03 | 0.0463 | 1.107E-05 | 0.0001 | 2.504E-06 | 0.0000 | 1.941E-03 | 0.0174 |
| Total             | 1.253E-02 | 0.1123 | 9.047E-02  | 0.8105 | 1.507E-03 | 0.0135 | 5.166E-03 | 0.0463 | 1.107E-05 | 0.0001 | 2.504E-06 | 0.0000 | 1.941E-03 | 0.0174 |

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

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 1.116E-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 | 1.116E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.8D

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 3.880E-02 | 0.2715 | 9.051E-02  | 0.6334 | 4.972E-03 | 0.0348 | 6.621E-03 | 0.0463 | 1.547E-05 | 0.0001 | 7.099E-06 | 0.0000 | 1.966E-03 | 0.0138 |
| Total             | 3.880E-02 | 0.2715 | 9.051E-02  | 0.6334 | 4.972E-03 | 0.0348 | 6.621E-03 | 0.0463 | 1.547E-05 | 0.0001 | 7.099E-06 | 0.0000 | 1.966E-03 | 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+01 years

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 1.429E-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 | 1.429E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.111E-01 | 0.4823 | 9.067E-02  | 0.3937 | 1.449E-02 | 0.0629 | 1.194E-02 | 0.0518 | 3.209E-05 | 0.0001 | 2.194E-05 | 0.0001 | 2.090E-03 | 0.0091 |
| Total             | 1.111E-01 | 0.4823 | 9.067E-02  | 0.3937 | 1.449E-02 | 0.0629 | 1.194E-02 | 0.0518 | 3.209E-05 | 0.0001 | 2.194E-05 | 0.0001 | 2.090E-03 | 0.0091 |

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

Water Dependent Pathways

| Radio-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 2.303E-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 | 2.303E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Total Dose Contributions TD0SE(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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 3.342E-01 | 0.6601 | 9.145E-02  | 0.1806 | 4.349E-02 | 0.0859 | 3.424E-02 | 0.0676 | 1.035E-04 | 0.0002 | 7.753E-05 | 0.0002 | 2.719E-03 | 0.0054 |
| Total             | 3.342E-01 | 0.6601 | 9.145E-02  | 0.1806 | 4.349E-02 | 0.0859 | 3.424E-02 | 0.0676 | 1.035E-04 | 0.0002 | 7.753E-05 | 0.0002 | 2.719E-03 | 0.0054 |

Total Dose Contributions TD0SE(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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 5.063E-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 | 5.063E-01     | 1.0000 |

\*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

| Radio-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 7.748E-01 | 0.7345 | 9.314E-02  | 0.0883 | 9.902E-02 | 0.0939 | 8.328E-02 | 0.0790 | 2.616E-04 | 0.0002 | 1.957E-04 | 0.0002 | 4.171E-03 | 0.0040 |
| Total             | 7.748E-01 | 0.7345 | 9.314E-02  | 0.0883 | 9.902E-02 | 0.0939 | 8.328E-02 | 0.0790 | 2.616E-04 | 0.0002 | 1.957E-04 | 0.0002 | 4.171E-03 | 0.0040 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| 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 | 1.055E+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 | 1.055E+00     | 1.0000 |

\*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WIND - WITH INTERNAL CONTRIBUTION

File : CLEAN.BD

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-<br>Nuclide | Ground    |        | Inhalation |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | Soil      |        |
|-------------------|-----------|--------|------------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
|                   | mrem/yr   | fract. | mrem/yr    | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. |
| Th-230            | 1.270E+00 | 0.7435 | 9.455E-02  | 0.0553 | 1.336E-01 | 0.0782 | 1.388E-01 | 0.0812 | 4.407E-04 | 0.0003 | 3.292E-04 | 0.0002 | 5.809E-03 | 0.0034 |
| Total             | 1.270E+00 | 0.7435 | 9.455E-02  | 0.0553 | 1.336E-01 | 0.0782 | 1.388E-01 | 0.0812 | 4.407E-04 | 0.0003 | 3.292E-04 | 0.0002 | 5.809E-03 | 0.0034 |

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-<br>Nuclide | Water     |        | Fish      |        | Radon     |        | Plant     |        | Meat      |        | Milk      |        | All Pathways* |        |
|-------------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
|                   | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr   | fract. | mrem/yr       | fract. |
| Th-230            | 6.406E-02 | 0.0375 | 1.158E-04 | 0.0001 | 0.000E+00 | 0.0000 | 4.944E-04 | 0.0003 | 5.754E-06 | 0.0000 | 6.538E-06 | 0.0000 | 1.708E+00     | 1.0000 |
| Total             | 6.406E-02 | 0.0375 | 1.158E-04 | 0.0001 | 0.000E+00 | 0.0000 | 4.944E-04 | 0.0003 | 5.754E-06 | 0.0000 | 6.538E-06 | 0.0000 | 1.708E+00     | 1.0000 |

\*Sum of all water independent and dependent pathways.

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

| Parent (i) | Product (j) | Branch Fraction | DSR(j,t) (mrem/yr)/(pCi/g) |           |           |           |           |           |           |           |
|------------|-------------|-----------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|            |             |                 | t= 0.000E+00               | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| Th-230     | Th-230      | 1.000E+00       | 9.815E-02                  | 9.815E-02 | 9.815E-02 | 9.814E-02 | 9.812E-02 | 9.804E-02 | 9.781E-02 | 9.700E-02 |
| Th-230     | Ra-226      | 1.000E+00       | 0.000E+00                  | 4.494E-03 | 1.344E-02 | 4.437E-02 | 1.294E-01 | 3.916E-01 | 9.076E-01 | 1.472E+00 |
| Th-230     | Pb-210      | 1.000E+00       | 0.000E+00                  | 4.260E-06 | 3.745E-05 | 3.839E-04 | 2.784E-03 | 1.664E-02 | 4.951E-02 | 1.391E-01 |
| Th-230     | DSR(j)      |                 | 9.815E-02                  | 1.027E-01 | 1.116E-01 | 1.429E-01 | 2.303E-01 | 5.063E-01 | 1.055E+00 | 1.708E+00 |

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter:  $CUMBRF(j) = BRFC(1) \dots F(2) \dots BRFC(j)$ .  
 The DSR includes contributions from associated (half-life  $\mu$  0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g  
 Basic Radiation Dose Limit = 100 mrem/yr

| Nuclide (i) | t= 0.000E+00 | 1.000E+00 | 3.000E+00 | 1.000E+01 | 3.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
|-------------|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Th-230      | 1.019E+03    | 9.742E+02 | 8.958E+02 | 6.998E+02 | 4.342E+02 | 1.975E+02 | 9.480E+01 | 5.853E+01 |

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) |
|-------------|---------------|--------------|-------------|-------------------|-------------|-------------------|
| Th-230      | 1.000E+00     | 1.000E+03    | 1.708E+00   | 5.853E+01         | 1.708E+00   | 5.853E+01         |





Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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Dose Conversion Factor (and Related) Parameter Summary

| Menu | Parameter                                                   | Current Value | Default   | Parameter Name |
|------|-------------------------------------------------------------|---------------|-----------|----------------|
| A-1  | Ground external gamma, volume DCF's, (mrem/yr)/(pCi/cm**3): |               |           |                |
| A-1  | Pb-210+D, soil density = 1.0 g/cm**3                        | 4.870E-03     | 4.870E-03 | DCF1( 1,1)     |
| A-1  | Pb-210+D, soil density = 1.8 g/cm**3                        | 2.310E-03     | 2.310E-03 | DCF1( 1,2)     |
| A-1  |                                                             |               |           |                |
| A-1  | Ra-226+D, soil density = 1.0 g/cm**3                        | 1.550E+01     | 1.550E+01 | DCF1( 2,1)     |
| A-1  | Ra-226+D, soil density = 1.8 g/cm**3                        | 8.560E+00     | 8.560E+00 | DCF1( 2,2)     |
| A-1  |                                                             |               |           |                |
| A-1  | Th-230, soil density = 1.0 g/cm**3                          | 2.110E-03     | 2.110E-03 | DCF1( 3,1)     |
| A-1  | Th-230, soil density = 1.8 g/cm**3                          | 1.030E-03     | 1.030E-03 | DCF1( 3,2)     |
| A-3  | Depth factors, ground external gamma, dimensionless:        |               |           |                |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = .15 m     | 8.800E-01     | 8.800E-01 | FD( 1,1,1)     |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 1,2,1)     |
| A-3  | Pb-210+D, soil density = 1.0 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 1,3,1)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = .15 m     | 9.700E-01     | 9.700E-01 | FD( 1,1,2)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 1,2,2)     |
| A-3  | Pb-210+D, soil density = 1.8 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 1,3,2)     |
| A-3  |                                                             |               |           |                |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = .15 m     | 6.300E-01     | 6.300E-01 | FD( 2,1,1)     |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = 0.5 m     | 9.200E-01     | 9.200E-01 | FD( 2,2,1)     |
| A-3  | Ra-226+D, soil density = 1.0 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 2,3,1)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = .15 m     | 8.500E-01     | 8.500E-01 | FD( 2,1,2)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = 0.5 m     | 1.000E+00     | 1.000E+00 | FD( 2,2,2)     |
| A-3  | Ra-226+D, soil density = 1.8 g/cm**3, thickness = 1.0 m     | 1.000E+00     | 1.000E+00 | FD( 2,3,2)     |
| A-3  |                                                             |               |           |                |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = .15 m       | 9.300E-01     | 9.300E-01 | FD( 3,1,1)     |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = 0.5 m       | 1.000E+00     | 1.000E+00 | FD( 3,2,1)     |
| A-3  | Th-230, soil density = 1.0 g/cm**3, thickness = 1.0 m       | 1.000E+00     | 1.000E+00 | FD( 3,3,1)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = .15 m       | 1.000E+00     | 1.000E+00 | FD( 3,1,2)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = 0.5 m       | 1.000E+00     | 1.000E+00 | FD( 3,2,2)     |
| A-3  | Th-230, soil density = 1.8 g/cm**3, thickness = 1.0 m       | 1.000E+00     | 1.000E+00 | FD( 3,3,2)     |
| B-1  | Dose conversion factors for inhalation, mrem/pCi:           |               |           |                |
| B-1  | Pb-210+D                                                    | 2.100E-02     | 2.100E-02 | DCF2( 1)       |
| B-1  | Ra-226+D                                                    | 7.900E-03     | 7.900E-03 | DCF2( 2)       |
| B-1  | Th-230                                                      | 7.000E-01     | 5.200E-01 | DCF2( 3)       |
| D-1  | Dose conversion factors for ingestion, mrem/pCi:            |               |           |                |
| D-1  | Pb-210+D                                                    | 6.700E-03     | 6.700E-03 | DCF3( 1)       |
| D-1  | Ra-226+D                                                    | 1.100E-03     | 1.100E-03 | DCF3( 2)       |
| D-1  | Th-230                                                      | 5.300E-04     | 5.300E-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 |                                                             |               |           |                |

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

Dose Conversion Factor (and Related) Parameter Summary (continued)

| Menu | Parameter                                              | Current Value | Default   | Parameter Name |
|------|--------------------------------------------------------|---------------|-----------|----------------|
| 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-210D , fish                                         | 3.000E+02     | 3.000E+02 | BIOFAC( 1,1)   |
| D-5  | Pb-210D , crustacea and mollusks                       | 1.000E+02     | 1.000E+02 | BIOFAC( 1,2)   |
| D-5  |                                                        |               |           |                |
| D-5  | Ra-226D , fish                                         | 5.000E+01     | 5.000E+01 | BIOFAC( 2,1)   |
| D-5  | Ra-226D , 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)   |

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

Site-Specific Parameter Summary

| Menu | Parameter                                       | User Input | Default   | Used by RESRAD (If different from user input) | Parameter Name |
|------|-------------------------------------------------|------------|-----------|-----------------------------------------------|----------------|
| R011 | Area of contaminated zone (m**2)                | 1.000E+02  | 1.000E+04 | ---                                           | AREA           |
| R011 | Thickness of contaminated zone (m)              | 2.000E+00  | 2.000E+00 | ---                                           | THICKO         |
| R011 | Length parallel to aquifer flow (m)             | 1.000E+02  | 1.000E+02 | ---                                           | LCZPAQ         |
| R011 | Basic radiation dose limit (mrem/yr)            | 1.000E+02  | 3.000E+01 | ---                                           | BRLO           |
| R011 | Time since placement of material (yr)           | 0.000E+00  | 0.000E+00 | ---                                           | T1             |
| R011 | Times for calculations (yr)                     | 1.000E+00  | 1.000E+00 | ---                                           | T( 2)          |
| R011 | Times for calculations (yr)                     | 3.000E+00  | 3.000E+00 | ---                                           | T( 3)          |
| R011 | Times for calculations (yr)                     | 1.000E+01  | 1.000E+01 | ---                                           | T( 4)          |
| R011 | Times for calculations (yr)                     | 3.000E+01  | 3.000E+01 | ---                                           | T( 5)          |
| R011 | Times for calculations (yr)                     | 1.000E+02  | 1.000E+02 | ---                                           | T( 6)          |
| R011 | Times for calculations (yr)                     | 3.000E+02  | 3.000E+02 | ---                                           | T( 7)          |
| R011 | Times for calculations (yr)                     | 1.000E+03  | 1.000E+03 | ---                                           | T( 8)          |
| R011 | Times for calculations (yr)                     | not used   | 3.000E+03 | ---                                           | T( 9)          |
| R011 | Times for calculations (yr)                     | not used   | 1.000E+04 | ---                                           | T(10)          |
| R012 | Initial principal radionuclide (pCi/g): Th-230  | 1.000E+00  | 0.000E+00 | ---                                           | S1( 3)         |
| 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 | ---                                           | COVERO         |
| R013 | Density of cover material (g/cm**3)             | not used   | 1.500E+00 | ---                                           | DENSCV         |
| R013 | Cover depth erosion rate (m/yr)                 | not used   | 1.000E-03 | ---                                           | VCV            |
| R013 | Density of contaminated zone (g/cm**3)          | 1.500E+00  | 1.500E+00 | ---                                           | DENSCZ         |
| R013 | Contaminated zone erosion rate (m/yr)           | 1.000E-03  | 1.000E-03 | ---                                           | VCZ            |
| R013 | Contaminated zone total porosity                | 4.000E-01  | 4.000E-01 | ---                                           | TPCZ           |
| R013 | Contaminated zone effective porosity            | 2.000E-01  | 2.000E-01 | ---                                           | EPCZ           |
| R013 | Contaminated zone hydraulic conductivity (m/yr) | 1.000E+01  | 1.000E+01 | ---                                           | HCCZ           |
| R013 | Contaminated zone b parameter                   | 5.300E+00  | 5.300E+00 | ---                                           | BCZ            |
| R013 | Humidity in air (g/m**3)                        | not used   | 8.000E+00 | ---                                           | HUMID          |
| R013 | Evapotranspiration coefficient                  | 5.000E-01  | 5.000E-01 | ---                                           | EVAPTR         |
| R013 | Precipitation (m/yr)                            | 1.000E+00  | 1.000E+00 | ---                                           | PRECIP         |
| R013 | Irrigation (m/yr)                               | 2.000E-01  | 2.000E-01 | ---                                           | RI             |
| R013 | Irrigation mode                                 | overhead   | overhead  | ---                                           | IDITCH         |
| R013 | Runoff coefficient                              | 2.000E-01  | 2.000E-01 | ---                                           | RUNOFF         |
| R013 | Watershed area for nearby stream or pond (m**2) | 1.000E+06  | 1.000E+06 | ---                                           | WAREA          |
| R013 | Accuracy for water/soil computations            | 1.000E-03  | 1.000E-03 | ---                                           | EPS            |
| R014 | Density of saturated zone (g/cm**3)             | 1.500E+00  | 1.500E+00 | ---                                           | DENSAG         |
| 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 hydraulic conductivity (m/yr)    | 1.000E+02  | 1.000E+02 | ---                                           | HCSZ           |
| R014 | Saturated zone hydraulic gradient               | 2.000E-02  | 2.000E-02 | ---                                           | HGWT           |
| R014 | Saturated zone b parameter                      | 5.300E+00  | 5.300E+00 | ---                                           | BSZ            |
| R014 | Water table drop rate (m/yr)                    | 1.000E-03  | 1.000E-03 | ---                                           | VWT            |
| R014 | Well pump intake depth (m below water table)    | 1.000E+01  | 1.000E+01 | ---                                           | DWIBWT         |
| R014 | Model: Nondispersion (ND) or Mass-Balance (MB)  | ND         | ND        | ---                                           | MODEL          |
| R014 | Individual's use of groundwater (m**3/yr)       | not used   | 2.500E+02 | ---                                           | UW             |
| R015 | Number of unsaturated zone strata               | 1          | 1         | ---                                           | NS             |

Site-Specific Parameter Summary (continued)

| Menu | Parameter                                         | User Input | Default   | Used by RESRAD (If different from user input) | Parameter Name |
|------|---------------------------------------------------|------------|-----------|-----------------------------------------------|----------------|
| R015 | Unsat. zone 1, thickness (m)                      | 4.000E+00  | 4.000E+00 | ---                                           | H(1)           |
| R015 | Unsat. zone 1, soil density (g/cm**3)             | 1.500E+00  | 1.500E+00 | ---                                           | DENSUZ(1)      |
| R015 | Unsat. zone 1, total porosity                     | 4.000E-01  | 4.000E-01 | ---                                           | TPUZ(1)        |
| R015 | Unsat. zone 1, effective porosity                 | 2.000E-01  | 2.000E-01 | ---                                           | EPUZ(1)        |
| R015 | Unsat. zone 1, soil-specific b parameter          | 5.300E+00  | 5.300E+00 | ---                                           | BUZ(1)         |
| R015 | Unsat. zone 1, hydraulic conductivity (m/yr)      | 1.000E+01  | 1.000E+01 | ---                                           | HCUZ(1)        |
| R016 | Distribution coefficients for Th-230              |            |           |                                               |                |
| R016 | Contaminated zone (cm**3/g)                       | 6.000E+04  | 6.000E+04 | ---                                           | DCNUCC( 3)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 6.000E+04  | 6.000E+04 | ---                                           | DCNUCU( 3,1)   |
| R016 | Saturated zone (cm**3/g)                          | 6.000E+04  | 6.000E+04 | ---                                           | DCNUCS( 3)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 2.778E-06                                     | ALEACH( 3)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                      | SOLUBK( 3)     |
| R016 | Distribution coefficients for daughter Pb-210     |            |           |                                               |                |
| R016 | Contaminated zone (cm**3/g)                       | 1.000E+02  | 1.000E+02 | ---                                           | DCNUCC( 1)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 1.000E+02  | 1.000E+02 | ---                                           | DCNUCU( 1,1)   |
| R016 | Saturated zone (cm**3/g)                          | 1.000E+02  | 1.000E+02 | ---                                           | DCNUCS( 1)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 1.663E-03                                     | ALEACH( 1)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                      | SOLUBK( 1)     |
| R016 | Distribution coefficients for daughter Ra-226     |            |           |                                               |                |
| R016 | Contaminated zone (cm**3/g)                       | 7.000E+01  | 7.000E+01 | ---                                           | DCNUCC( 2)     |
| R016 | Unsat. zone 1 (cm**3/g)                           | 7.000E+01  | 7.000E+01 | ---                                           | DCNUCU( 2,1)   |
| R016 | Saturated zone (cm**3/g)                          | 7.000E+01  | 7.000E+01 | ---                                           | DCNUCS( 2)     |
| R016 | Leach rate (/yr)                                  | 0.000E+00  | 0.000E+00 | 2.374E-03                                     | ALEACH( 2)     |
| R016 | Solubility constant                               | 0.000E+00  | 0.000E+00 | not used                                      | SOLUBK( 2)     |
| R017 | Inhalation rate (m**3/yr)                         | 8.400E+03  | 8.400E+03 | ---                                           | INHALR         |
| R017 | Mass loading for inhalation (g/m**3)              | 2.000E-04  | 2.000E-04 | ---                                           | MLINH          |
| R017 | Dilution length for airborne dust, inhalation (m) | 3.000E+00  | 3.000E+00 | ---                                           | LM             |
| R017 | Exposure duration                                 | 3.000E+01  | 3.000E+01 | ---                                           | ED             |
| R017 | Shielding factor, inhalation                      | 1.000E+00  | 4.000E-01 | ---                                           | SHF3           |
| R017 | Shielding factor, external gamma                  | 1.000E+00  | 7.000E-01 | ---                                           | SHF1           |
| R017 | fraction of time spent indoors                    | 0.000E+00  | 5.000E-01 | ---                                           | FIND           |
| R017 | fraction of time spent outdoors (on site)         | 1.000E+00  | 2.500E-01 | ---                                           | FOTD           |
| R017 | Shape factor, external gamma                      | 1.000E+00  | 1.000E+00 | ---                                           | FS1            |

Site-Specific Parameter Summary (continued)

| Menu | Parameter                                        | User Input | Default   | Used by RESRAD<br>(if different from user input) | Parameter Name |
|------|--------------------------------------------------|------------|-----------|--------------------------------------------------|----------------|
| R017 | Fractions of annular areas within AREA:          |            |           |                                                  |                |
| R017 | Outer annular radius (m) = $\kappa(1/D)$         | not used   | 1.000E+00 | ---                                              | FRACA( 1)      |
| R017 | Outer annular radius (m) = $\kappa(10/D)$        | not used   | 1.000E+00 | ---                                              | FRACA( 2)      |
| R017 | Outer annular radius (m) = $\kappa(20/D)$        | not used   | 1.000E+00 | ---                                              | FRACA( 3)      |
| R017 | Outer annular radius (m) = $\kappa(50/D)$        | not used   | 1.000E+00 | ---                                              | FRACA( 4)      |
| R017 | Outer annular radius (m) = $\kappa(100/D)$       | not used   | 1.000E+00 | ---                                              | FRACA( 5)      |
| R017 | Outer annular radius (m) = $\kappa(200/D)$       | not used   | 1.000E+00 | ---                                              | FRACA( 6)      |
| R017 | Outer annular radius (m) = $\kappa(500/D)$       | not used   | 1.000E+00 | ---                                              | FRACA( 7)      |
| R017 | Outer annular radius (m) = $\kappa(1000/D)$      | not used   | 1.000E+00 | ---                                              | FRACA( 8)      |
| R017 | Outer annular radius (m) = $\kappa(5000/D)$      | not used   | 1.000E+00 | ---                                              | FRACA( 9)      |
| R017 | Outer annular radius (m) = $\kappa(1.E+04/D)$    | not used   | 1.000E+00 | ---                                              | FRACA(10)      |
| R017 | Outer annular radius (m) = $\kappa(1.E+05/D)$    | not used   | 0.000E+00 | ---                                              | FRACA(11)      |
| R017 | Outer annular radius (m) = $\kappa(1.E+06/D)$    | not used   | 0.000E+00 | ---                                              | FRACA(12)      |
| R018 | Fruits, vegetables and grain consumption (kg/yr) | 1.600E+02  | 1.600E+02 | ---                                              | DIET(1)        |
| R018 | Leafy vegetable consumption (kg/yr)              | 1.400E+01  | 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)             | 6.300E+01  | 6.300E+01 | ---                                              | DIET(4)        |
| R018 | Fish consumption (kg/yr)                         | 5.400E+00  | 5.400E+00 | ---                                              | DIET(5)        |
| R018 | Other seafood consumption (kg/yr)                | 9.000E-01  | 9.000E-01 | ---                                              | DIET(6)        |
| R018 | Soil ingestion rate (g/yr)                       | 3.650E+01  | 3.650E+01 | ---                                              | SOIL           |
| R018 | Drinking water intake (L/yr)                     | 5.100E+02  | 5.100E+02 | ---                                              | DWI            |
| R018 | Contamination fraction of drinking water         | 1.000E+00  | 1.000E+00 | ---                                              | FDW            |
| R018 | Contamination fraction of household water        | 1.000E+00  | 1.000E+00 | ---                                              | FHHW           |
| R018 | Contamination fraction of livestock water        | 1.000E+00  | 1.000E+00 | ---                                              | FLW            |
| R018 | Contamination fraction of irrigation water       | 1.000E+00  | 1.000E+00 | ---                                              | FIRW           |
| R018 | Contamination fraction of aquatic food           | 5.000E-01  | 5.000E-01 | ---                                              | FR9            |
| R018 | Contamination fraction of plant food             | -1         | -1        | 0.500E-01                                        | FPLANT         |
| R018 | Contamination fraction of meat                   | -1         | -1        | 0.500E-02                                        | FMEAT          |
| R018 | Contamination fraction of milk                   | -1         | -1        | 0.500E-02                                        | FMILK          |
| R019 | Livestock fodder intake for meat (kg/day)        | 6.800E+01  | 6.800E+01 | ---                                              | LF15           |
| R019 | Livestock fodder intake for milk (kg/day)        | 5.500E+01  | 5.500E+01 | ---                                              | LF16           |
| R019 | Livestock water intake for meat (L/day)          | 5.000E+01  | 5.000E+01 | ---                                              | LW15           |
| R019 | Livestock water intake for milk (L/day)          | 1.600E+02  | 1.600E+02 | ---                                              | LW16           |
| R019 | Livestock soil intake (kg/day)                   | 5.000E-01  | 5.000E-01 | ---                                              | LS1            |
| 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       | 1.000E+00  | 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          |
| 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 | ---                                              | EVSF           |

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

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Site-Specific Parameter Summary (continued)

| Menu | Parameter                                      | User Input | Default   | Used by RESRAD (if different from user input) | Parameter Name |
|------|------------------------------------------------|------------|-----------|-----------------------------------------------|----------------|
| 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          |
| R021 | Thickness of building foundation (m)           | not used   | 1.500E-01 | ---                                           | FLOOR          |
| 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 | ---                                           | PH20CV         |
| R021 | Volumetric water content of the foundation     | not used   | 3.000E-02 | ---                                           | PH20FL         |
| 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                      | 2.000E-06  | 2.000E-06 | ---                                           | DIFCZ          |
| R021 | Radon vertical dimension of mixing (m)         | 2.000E+00  | 2.000E+00 | ---                                           | HMIX           |
| R021 | Average annual wind speed (m/sec)              | 2.000E+00  | 2.000E+00 | ---                                           | WIND           |
| 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 | code computed (time dependent)                | FAI            |
| R021 | Building depth below ground surface (m)        | not used   | 1.000E+00 | ---                                           | DMFL           |
| R021 | Emanating power of Rn-222 gas                  | 2.500E-01  | 2.500E-01 | ---                                           | EMANA(1)       |
| R021 | Emanating power of Rn-220 gas                  | not used   | 1.500E-01 | ---                                           | EMANA(2)       |

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                  | active         |

Summary : Th-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

|                                                                                                                                    |                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Contaminated Zone Dimensions<br>~~~~~<br>Area:    100.00 square meters<br>Thickness:    2.00 meters<br>Cover Depth:    0.00 meters | Initial Soil Concentrations, pCi/g<br>~~~~~<br>Th-230    1.000E+00 |
|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 100 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

~~~~~

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	9.815E-02	1.021E-01	1.101E-01	1.379E-01	2.158E-01	4.628E-01	9.559E-01	1.575E+00
M(t):	9.815E-04	1.021E-03	1.101E-03	1.379E-03	2.158E-03	4.628E-03	9.559E-03	1.575E-02

Maximal TDOSE(t): 1.575E+00 mrem/yr at t = 1.000E+03 years

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.112E-03	0.0113	9.046E-02	0.9216	0.000E+00	0.0000	4.636E-03	0.0472	9.508E-06	0.0001	6.780E-07	0.0000	1.935E-03	0.0197
Total	1.112E-03	0.0113	9.046E-02	0.9216	0.000E+00	0.0000	4.636E-03	0.0472	9.508E-06	0.0001	6.780E-07	0.0000	1.935E-03	0.0197

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- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	9.815E-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	9.815E-02	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	4.929E-03	0.0483	9.047E-02	0.8856	5.663E-08	0.0000	4.806E-03	0.0470	1.000E-05	0.0001	1.276E-06	0.0000	1.936E-03	0.0190
Total	4.929E-03	0.0483	9.047E-02	0.8856	5.663E-08	0.0000	4.806E-03	0.0470	1.000E-05	0.0001	1.276E-06	0.0000	1.936E-03	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+00 years

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.021E-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	1.021E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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

Water Independent Pathways (inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.253E-02	0.1138	9.047E-02	0.8216	1.694E-07	0.0000	5.166E-03	0.0469	1.107E-05	0.0001	2.504E-06	0.0000	1.941E-03	0.0176
Total	1.253E-02	0.1138	9.047E-02	0.8216	1.694E-07	0.0000	5.166E-03	0.0469	1.107E-05	0.0001	2.504E-06	0.0000	1.941E-03	0.0176

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.101E-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	1.101E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	3.880E-02	0.2813	9.051E-02	0.6562	5.589E-07	0.0000	6.621E-03	0.0480	1.547E-05	0.0001	7.099E-06	0.0001	1.966E-03	0.0143
Total	3.880E-02	0.2813	9.051E-02	0.6562	5.589E-07	0.0000	6.621E-03	0.0480	1.547E-05	0.0001	7.099E-06	0.0001	1.966E-03	0.0143

Total Dose Contributions TD0SE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.379E-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	1.379E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.111E-01	0.5146	9.067E-02	0.4201	1.628E-06	0.0000	1.194E-02	0.0553	3.209E-05	0.0001	2.194E-05	0.0001	2.090E-03	0.0097
Total	1.111E-01	0.5146	9.067E-02	0.4201	1.628E-06	0.0000	1.194E-02	0.0553	3.209E-05	0.0001	2.194E-05	0.0001	2.090E-03	0.0097

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.158E-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	2.158E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	3.342E-01	0.7222	9.145E-02	0.1976	4.888E-06	0.0000	3.424E-02	0.0740	1.035E-04	0.0002	7.753E-05	0.0002	2.719E-03	0.0059
Total	3.342E-01	0.7222	9.145E-02	0.1976	4.888E-06	0.0000	3.424E-02	0.0740	1.035E-04	0.0002	7.753E-05	0.0002	2.719E-03	0.0059

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

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio- Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.628E-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	4.628E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	7.748E-01	0.8106	9.314E-02	0.0974	1.113E-05	0.0000	8.328E-02	0.0871	2.616E-04	0.0003	1.957E-04	0.0002	4.171E-03	0.0044
Total	7.748E-01	0.8106	9.314E-02	0.0974	1.113E-05	0.0000	8.328E-02	0.0871	2.616E-04	0.0003	1.957E-04	0.0002	4.171E-03	0.0044

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

Water Dependent Pathways

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	9.559E-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	9.559E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	1.270E+00	0.8066	9.455E-02	0.0600	1.502E-05	0.0000	1.388E-01	0.0881	4.407E-04	0.0003	3.292E-04	0.0002	5.809E-03	0.0037
Total	1.270E+00	0.8066	9.455E-02	0.0600	1.502E-05	0.0000	1.388E-01	0.0881	4.407E-04	0.0003	3.292E-04	0.0002	5.809E-03	0.0037

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- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Th-230	6.406E-02	0.0407	1.158E-04	0.0001	0.000E+00	0.0000	4.944E-04	0.0003	5.754E-06	0.0000	6.538E-06	0.0000	1.575E+00	1.0000
Total	6.406E-02	0.0407	1.158E-04	0.0001	0.000E+00	0.0000	4.944E-04	0.0003	5.754E-06	0.0000	6.538E-06	0.0000	1.575E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : TH-230 CLEANUP CRITERIA - OUTDOOR - WITH INTERNAL CONTRIBUTION

File : CLEAN.7D

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

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g)							
			t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Th-230	Th-230	1.000E+00	9.815E-02	9.815E-02	9.815E-02	9.814E-02	9.812E-02	9.804E-02	9.781E-02	9.700E-02
Th-230	Ra-226	1.000E+00	0.000E+00	3.990E-03	1.194E-02	3.940E-02	1.149E-01	3.482E-01	8.086E-01	1.339E+00
Th-230	Pb-210	1.000E+00	0.000E+00	4.260E-06	3.745E-05	3.839E-04	2.784E-03	1.664E-02	4.951E-02	1.391E-01
Th-230	DSR(j)		9.815E-02	1.021E-01	1.101E-01	1.379E-01	2.158E-01	4.628E-01	9.559E-01	1.575E+00

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

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 100 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Th-230	1.019E+03	9.790E+02	9.081E+02	7.250E+02	4.633E+02	2.161E+02	1.046E+02	6.350E+01

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)
Th-230	1.000E+00	1.000E+03	1.575E+00	6.350E+01	1.575E+00	6.350E+01