Risk Assessment and Optimization (ALARA) Analysis
for the Environmental Remediation of
Brookhaven National Laboratory's
Hazardous Waste Management Facility

Appendices

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Appendix A

RESRAD Pathways/Parameters for Hazardous Waste Management Facility (HWMF) Soil Cleanup Guidelines, Soil to Water Screening Levels, and Dose to Visitors at the Open Space

**RESRAD Pathways/Parameters for
Hazardous Waste Management Facility (HWMF)
Soil Cleanup Guidelines,
Soil-to-Water Screening Levels
and
Dose to Open-Space Visitors**

Pathway	Undeveloped Open-Space Scenario Soil Cleanup Guidelines (Maximum Exposed Individual)	Resident Scenario Soil to Water Screening Guidelines (Maximum Exposed Individual)	Undeveloped Open-Space Scenario Visitor Dose Topsoil (0-1 ft) (Average Individual)	Undeveloped Open-Space Scenario Visitor Dose At Depth (1-12 ft) (Average Individual)
External gamma exposure	Yes	No	Yes	Yes
Inhalation of dust	Yes	No	Yes	Yes
Ingestion of plant foods	Yes	No	Yes	Yes
Ingestion of meat	Yes	No	Yes	Yes
Ingestion of milk	No	No	No	No
Ingestion of fish	No	No	No	No
Ingestion of water	No	Yes	No	No
Ingestion of soil	Yes	No	Yes	Yes
Inhalation of Radon/Thoron	Yes	No	Yes	Yes

Parameters	Undeveloped Open-Space Scenario Soil Cleanup Guidelines (Maximum Exposed Individual)	Resident Scenario Soil to Water Screening Guidelines (Maximum Exposed Individual)	Open- Space Scenario Visitor Dose - Topsoil (0-1 ft) (Average Individual)	Open- Space Scenario Visitor Dose - Soil At Depth (1-12 ft) (Average Individual)	Source of Parameter Data
Area of contaminated zone (m ²) Site-Specific Value	19,400	20,000	19,400	6,800	CDM 1996 Meinhold 1997
Thickness of contaminated zone (m) Site -Specific Value	3.66	2	0.3048	3.35	CDM 1996 Meinhold 1997
Length parallel to aquifer flow (m) Site -Specific Value	161.5	250	161.5	64	CDM 1996 Meinhold 1997
Basic radiation dose limit (mrem/yr)	15/75	15	15	15	USNRC& USEPA Proposed Rules
Time since placement of radioactive material (yr)	0	0	0	0	ANL 1993b p.130
Cover depth (m) Site -Specific Value	0	0	0	0.3048	ANL 1995
Density of cover material (g/cm ³) Site -Specific Value	NA	NA	NA	1.66	ANL 1995

Cover depth erosion rate (m/yr) Site -Specific Value	NA	NA	NA	0.001	ANL 1993b p.78
Density of contaminated zone (g/cm ³) Site - Specific Value	1.66	1.66	1.66	1.66	CDM 1991
Contaminated zone erosion rate (m/yr) Site - Specific Value	0.001	0.001	0.001	0.001	ANL 1993 p.78
Contaminated zone total porosity Site -Specific Value	0.33	0.33	0.33	0.33	Warren 1968
Contaminated zone effective porosity Site - Specific Value	0.24	0.24	0.24	0.24	Warren 1968
Contaminated zone hydraulic conductivity (m/yr) Site -Specific Value	5000	5000	5000	5000	Warren 1968 USGS 1992 CDM 1995b
Contaminated zone b parameter	4.9	4.9	5.3	5.3	RESRAD calc. ANL 1993b p.75
Evapotranspiration coefficients	0.46	0.46	0.46	0.46	ANL 1995
Precipitation (m/yr)	1.23	1.23	1.23	1.23	Nagle 1975 & 1978
Irrigation (m/yr)	0	0.26	0	0	Meinhold 1997
Irrigation mode	NA	Overhead	NA	NA	ANL 1995

Runoff coefficient	0.2	0.2	0.2	0.2	ANL 1995
Watershed area from nearby stream or pond	10 ⁶	10 ⁶	10 ⁶	10 ⁶	ANL 1993b p.83
Accuracy for water/soil computations	0.001	0.001	0.001	0.001	ANL 1995
Density of saturated zone (g/cm ³) Site - Specific Value	1.66	1.66	1.66	1.66	ANL 1995 CDM 1991
Saturated zone total porosity	0.33	0.33	0.33	0.33	ANL 1995 Warren 1968
Saturated zone effective porosity	0.24	0.24	0.24	0.24	ANL 1995 Warren 1968
Saturated zone hydraulic conductivity (m/yr) Site - Specific Value	20,000	20,000	20,000	20,000	ANL 1995 CDM 1995b
Saturated zone hydraulic gradient Site -Specific Value	0.0048	0.001	0.0048	0.0048	ANL 1995 CDM 1995b
Saturated zone b parameter	4.9	4.9	5.3	5.3	RESRAD calc. ANL 1993b p.75
Water table drop rate (m/yr) Site -Specific Value	0.001	0.001	0.001	0.001	ANL 1995 ANL 1993b p. 85
Well pump intake depth (m below water table)	18	18	18	18	Local Knowledge

Model: Nondispersion (ND) or Mass-Balance (MB)	NA	ND	NA	NA	ANL 1993a App E ANL 1995
Well pumping rate (m ³ /yr)	250	250	250	250	ANL 1995
Number of Uncontaminated unsaturated zone strata Site - Specific Value	0	1	1	0	ANL 1995 SAIC 1992
Unsat. zone 1, thickness (m) Site -Specific Value	NA	8.6	3.35	NA	CDM 1996 Meinhold 1997
Unsat. zone 1, soil density (g/cm ³) Site - Specific Value	NA	1.66	1.66	NA	ANL 1995 CDM 1991
Unsat. zone 1, total porosity Site -Specific Value	NA	0.33	0.33	NA	ANL 1995 Warren 1968
Unsat. zone 1, effective porosity Site -Specific Value	NA	0.24	0.24	NA	ANL 1995 Warren 1968
Unsat. zone 1, soil-specific b parameter	NA	4.9	4.9	NA	RESRAD calc. ANL 1993b p.75
Unsaturated zone 1, hydraulic conductivity (m/yr) Site -Specific Value	NA	5,000	5,000	NA	Warren 1968 USGS 1992 CDM 1995b

Exposure Frequency (d/yr) (not used as input value)	300 d/yr @ 1 hr/d	350	3 d/yr	3 d/yr	Meinhold 1997
Daily inhalation rate (m ³ /d) (not used as input value)	20	20	118	57.8	Meinhold 1997
Annual inhalation rate (m ³ /y)	20,000	7,300	15,000	15,000	Meinhold 1997
Daily drinking rate (L/d) (not used as input value)	NA	2*	NA	NA	Meinhold 1997
Annual drinking rate (l/y)	NA	700*	NA	NA	Meinhold 1997
Mass loading for inhalation (g/m ³)	0.00001	0.0001	0.00001	0.00001	Meinhold 1997 ANL 1993b p.110
Dilution length for airborne dust, inhalation (m)	3	3	3	3	ANL 1995
Exposure duration (yr)	30	30	30	30	ANL 1995 EPA1991b Meinhold 1997
Shielding factor, inhalation	1.0	0.4	1.0	1.0	ANL 1993b p. 112 Meinhold 1997
Shielding factor, external gamma	1.0	0.8	1.0	1.0	ANL 1993b p. 129 Meinhold 1997

Fraction of time spent indoors	0.0	0.50	0.0	0.0	Cohen 1994 EPA 1991b Meinhold 1997
Fraction of time spent outdoors	0.073	0.25	0.0014	0.0014	Cohen 1994 EPA 1991b Meinhold 1997
Shape factor, external gamma	1.0	1.0	1.0	1.0	ANL 1993b p. 131
Fruits, vegetables and grain consumption (kg/yr)	160	NA	160	160	Meinhold 1997
Leafy vegetable consumption (kg/yr)	0	NA	0	0	Meinhold 1997
Meat ingestion rate (kg/yr)	63	NA	51.1	51.1	Meinhold 1997
Soil ingestion rate (g/yr)	36.5	NA	18	18	BNL 1996
Household water fraction contaminated	0	1	0	0	Meinhold 1997
Livestock water fraction contaminated	0	NA	0	0	Meinhold 1997
Irrigation water fraction contaminated	0	1	0	0	Meinhold 1997
Contaminated fraction of plants	0.006	0.2	0.0003	0.0003	Meinhold 1997

Contaminated fraction of meat	0.14	NA	0.02	0.02	Meinhold 1997
Livestock fodder intake for meat (kg/d)	1.36	NA	1.36	1.36	ANL 1993a p.181
Livestock water intake for meat (l/d)	50	NA	50	50	ANL 1995
Livestock intake for soil (kg/d)	0.01	NA	0.01	0.01	Meinhold 1997
Mass loading for foliar deposition (g/m ³)	0.00001	0.0001	0.00001	0.00001	Meinhold 1997 ANL 1993b p.110
Depth of soil mixing layer (m)	0.15	0.15	0.15	0.15	ANL 1995
Depth of roots (m)	0.9	NA	0.9	0.9	ANL 1993b p. 113
Household fractional usage from groundwater	0	1	0	0	Meinhold 1997
Irrigation fractional usage from groundwater	0	1	0	0	Meinhold 1997
Livestock fractional usage from groundwater	0	NA	0	0	Meinhold 1997
Storage times for contaminated foodstuffs					
Fruits, non-leafy veg. & grains (d)	14	NA	14	14	ANL 1995
Leafy vegetables (d)	1	NA	1	1	ANL 1995
Meat (d)	20	NA	20	20	ANL 1995

Water well (d)	NA	1	NA	NA	ANL 1995
Water surface (d)	NA	NA	NA	NA	ANL 1995
Livestock fodder (d)	0	NA	0	0	ANL 1995
Thickness of material (m) Site -Specific Values					
in foundation	NA	0.15	NA	NA	ANL 1993b p.52
in contaminated zone soil	0	0	0	0	ANL 1993b p.52
Density of material (g/cm ³) Site -Specific Values					
in the foundation	NA	2.4	NA	NA	ANL 1995
in the contaminated soil	NA	NA	NA	NA	ANL 1995
Total porosity of material Site -Specific Values					
in the foundation	NA	0.1	NA	NA	ANL 1993b p.44
in the contaminated soil	NA	NA	NA	NA	ANL 1993b p.44
Volumetric water content Site -Specific Values					
in the foundation	NA	0.03	NA	NA	RESRAD calc. ANL 1993b p.47

in the contaminated soil	NA	NA	NA	NA	RESRAD calc. ANL 1993b p.47
Diffusion coefficient for radon gas (m/sec) Site - Specific Values					
in the foundation	NA	3E-7	NA	NA	ANL 1993b p.52
in the contaminated soil	NA	NA	NA	NA	ANL 1993b p.52
Contamination zone radon diffusion coefficient	2E-6	2E-6	2E-6	2E-6	ANL 1993b p.52
Radon vertical dimension of mixing	2	2	2	2	ANL 1993b p.87
Average annual wind speed (m/sec)	6.23	6.23	6.23	6.23	Nagle 1975
Average building air exchange rate (1/hr)	NA	0.5	NA	NA	ANL 1993b p.89
Height of the building (room) (m)	NA	2.5	NA	NA	ANL 1993b p.91
Building interior area factor	NA	0	NA	NA	ANL 1993b p.92
Building depth below ground surface(m)	NA	1	NA	NA	ANL 1993b p.95
Emanating power of Rn-222 gas	0.25	0.25	0.25	0.25	ANL 1993b p.58
Emanating power of Rn-220 gas	0.15	0.15	0.15	0.15	ANL 1993b p.58

Distribution Coefficients Used

Radionuclide	Distribution Coefficient K_d (cm³/g)	Source of Data
Cesium-137	4.4 E+01	Fuhrmann 1996
Radium-226	1.3 E+02	Fuhrmann 1996
Strontium-90	3.0 E+00	Fuhrmann 1995
Uranium-234	1.7 E+01	Fuhrmann 1995
Uranium-235	1.7 E+01	Fuhrmann 1995
Uranium-238	1.7 E+01	Fuhrmann 1995

Appendix B

Hazardous Waste Management Facility
(HWMF)

Soil Cleanup Guidelines
for Open Space Scenario at 50 Years
and

15 mrem/yr: RESRAD Printouts

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Part I: Mixture Sums and Single Radionuclide Guidelines

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Time = 0.000E+00	15
Time = 1.000E+00	16
Time = 3.000E+00	17
Time = 1.000E+01	18
Time = 3.000E+01	19
Time = 5.000E+01	20
Time = 1.000E+02	21
Time = 3.000E+02	22
Time = 5.000E+02	23
Time = 1.000E+03	24
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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2 (1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2 (2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2 (3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2 (4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2 (5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2 (6)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2 (7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2 (8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2 (9)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2 (10)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2 (11)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2 (12)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2 (13)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2 (14)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2 (15)
B-1	Th-230	3.260E-01	3.260E-01	DCF2 (16)
B-1	Th-232	1.640E+00	1.640E+00	DCF2 (17)
B-1	U-233	1.350E-01	1.350E-01	DCF2 (18)
B-1	U-234	1.320E-01	1.320E-01	DCF2 (19)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2 (20)
B-1	U-236	1.250E-01	1.250E-01	DCF2 (21)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2 (22)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3 (1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3 (2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3 (3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3 (4)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3 (5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3 (6)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3 (7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3 (8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3 (9)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3 (10)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3 (11)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3 (12)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3 (13)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3 (14)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3 (15)
D-1	Th-230	5.480E-04	5.480E-04	DCF3 (16)
D-1	Th-232	2.730E-03	2.730E-03	DCF3 (17)
D-1	U-233	2.890E-04	2.890E-04	DCF3 (18)
D-1	U-234	2.830E-04	2.830E-04	DCF3 (19)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3 (20)
D-1	U-236	2.690E-04	2.690E-04	DCF3 (21)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3 (22)

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMFOSP.DAT

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

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(9,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(11,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(12,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(12,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(12,3)
D-34				

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMFOSP.DAT

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

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(13,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(13,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(13,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(14,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(15,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(18,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(18,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(18,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(19,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(19,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(19,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-5				
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 wrem/y

File : HWMFOSP.DAT

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

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(8,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(9,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(9,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(11,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(11,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(12,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(12,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(13,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(14,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(14,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(15,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(18,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(18,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(19,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(19,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(20,2)

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

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

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 wrem/y

File : HWMFOSP.DAT

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)	1.932E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.660E+00	2.000E+00	---	THICKO
R011	Length parallel to aquifer flow (m)	1.615E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (wrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	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)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	SI(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	SI(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	SI(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	SI(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	SI(9)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	SI(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	SI(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	SI(13)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	SI(19)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	SI(20)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	SI(22)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	WI(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	WI(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	WI(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	WI(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	WI(9)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	WI(10)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	WI(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	WI(13)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	WI(19)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	WI(20)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	WI(22)
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)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	BPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	BPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TFSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	BPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+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)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC(2)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.819E-05	ALBACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC(3)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.840E-03	ALBACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(4)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.507E-03	ALBACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(8)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALBACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(9)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALBACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(10)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALBACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCC(11)
R016	Saturated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.499E-04	ALBACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(13)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.568E-02	ALBACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(19)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALBACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(20)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALBACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(22)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALBACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCC(1)
R016	Saturated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.457E-04	ALBACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCC(5)
R016	Saturated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.168E-02	ALBACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCC(6)
R016	Saturated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALBACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCC(7)
R016	Saturated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.094E-04	ALBACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCC(12)
R016	Saturated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.499E-04	ALBACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(14)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALBACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(15)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALBACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(16)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALBACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(17)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALBACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(18)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALBACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(21)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALBACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R017	Inhalation rate (m**3/yr)	2.000E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	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)	7.300E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	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)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	0.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	0.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	6.000E-03	-1	---	FPLANT
R018	Contamination fraction of meat	1.400E-01	-1	---	FMBAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	1.360E+00	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	0.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	0.000E+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	---	EVSIN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSIN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	0.000E+00	4.500E+01	---	STOR_T(9)
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

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMFOSP.DAT

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	6.230E+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	1.500E-01	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	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	19315.00 square meters	Am-241	1.000E+00
Thickness:	3.66 meters	Co-60	1.000E+00
Cover Depth:	0.00 meters	Cs-137	1.000E+00
		Pu-238	1.000E+00
		Pu-239	1.000E+00
		Pu-240	1.000E+00
		Ra-226	1.000E+00
		Sr-90	1.000E+00
		U-234	1.000E+00
		U-235	1.000E+00
		U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr										
Basic Radiation Dose Limit = 15 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	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
TDOSE(t):	2.394E+00	2.246E+00	2.000E+00	1.497E+00	1.126E+00	1.041E+00	9.307E-01	6.919E-01	5.350E-01	2.916E-01
M(t):	1.596E-01	1.497E-01	1.334E-01	9.981E-02	7.505E-02	6.939E-02	6.205E-02	4.613E-02	3.567E-02	1.944E-02
Maximum TDOSE(t): 2.394E+00 mrem/yr at t = 0.000E+00 years										

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMFOSP.DAT

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	2.865E-03	0.0028	5.840E-03	0.0056	0.000E+00	0.0000	3.218E-03	0.0031	1.680E-05	0.0000	0.000E+00	0.0000	8.926E-03	0.0086
Co-60	1.426E-03	0.0014	3.981E-09	0.0000	0.000E+00	0.0000	2.615E-06	0.0000	7.120E-07	0.0000	0.000E+00	0.0000	9.118E-08	0.0000
Cs-137	6.528E-02	0.0627	1.267E-07	0.0000	0.000E+00	0.0000	5.330E-04	0.0005	2.365E-04	0.0002	0.000E+00	0.0000	3.702E-05	0.0000
Pu-238	7.296E-06	0.0000	3.737E-03	0.0036	4.096E-14	0.0000	2.049E-03	0.0020	2.138E-05	0.0000	0.000E+00	0.0000	5.687E-03	0.0055
Pu-239	2.057E-05	0.0000	6.061E-03	0.0058	0.000E+00	0.0000	3.361E-03	0.0032	3.508E-05	0.0000	0.000E+00	0.0000	9.325E-03	0.0090
Pu-240	1.047E-05	0.0000	6.038E-03	0.0058	2.585E-18	0.0000	3.348E-03	0.0032	3.494E-05	0.0000	0.000E+00	0.0000	9.289E-03	0.0089
Ra-226	7.278E-01	0.6992	3.646E-04	0.0004	2.029E-04	0.0002	1.006E-01	0.0967	1.624E-03	0.0016	0.000E+00	0.0000	1.789E-02	0.0172
Sr-90	9.176E-05	0.0001	9.566E-07	0.0000	0.000E+00	0.0000	2.249E-03	0.0022	2.303E-04	0.0002	0.000E+00	0.0000	2.083E-05	0.0000
U-234	2.406E-05	0.0000	1.367E-03	0.0013	9.282E-10	0.0000	4.921E-04	0.0005	8.239E-06	0.0000	0.000E+00	0.0000	5.463E-04	0.0005
U-235	3.843E-02	0.0369	1.333E-03	0.0013	0.000E+00	0.0000	5.721E-04	0.0005	1.772E-05	0.0000	0.000E+00	0.0000	5.587E-04	0.0005
U-238	6.878E-03	0.0066	1.221E-03	0.0012	4.178E-14	0.0000	4.674E-04	0.0004	7.827E-06	0.0000	0.000E+00	0.0000	5.188E-04	0.0005
Total	8.428E-01	0.8097	2.596E-02	0.0249	2.029E-04	0.0002	1.169E-01	0.1123	2.233E-03	0.0021	0.000E+00	0.0000	5.280E-02	0.0507

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.086E-02	0.0200
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.429E-03	0.0014
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.609E-02	0.0635
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.150E-02	0.0110
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.880E-02	0.0181
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.872E-02	0.0180
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.485E-01	0.8151
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.593E-03	0.0025
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.438E-03	0.0023
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.091E-02	0.0393
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.093E-03	0.0087
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	1.041E+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	Product	Branch	DSR(j,t) (mrem/yr)/(pCi/g)										
(i)	(j)	Fraction	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
U-238	U-238	1.000E+00		1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.954E-04	1.954E-05
U-238	U-234	1.000E+00		0.000E+00	9.539E-09	2.810E-08	8.936E-08	2.354E-07	3.447E-07	4.989E-07	4.105E-07	1.877E-07	1.479E-08
U-238	Th-230	1.000E+00		0.000E+00	8.692E-14	7.675E-13	8.245E-12	6.805E-11	1.736E-10	5.644E-10	2.360E-09	3.385E-09	3.940E-09
U-238	Ra-226	1.000E+00		0.000E+00	1.527E-15	4.092E-14	1.478E-12	3.719E-11	1.606E-10	1.082E-09	1.533E-08	3.980E-08	9.613E-08
U-238	Pb-210	1.000E+00		0.000E+00	1.902E-18	1.191E-16	1.252E-14	8.254E-13	5.356E-12	5.788E-11	1.331E-09	3.877E-09	1.012E-08
U-238	EDSR(j)			1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.957E-04	1.966E-05

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

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 15 mrem/yr

Nuclide	(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241			6.616E+02	6.627E+02	6.649E+02	6.727E+02	6.954E+02	7.189E+02	7.812E+02	1.089E+03	1.519E+03	3.486E+03
Co-60			1.335E+01	1.525E+01	1.992E+01	5.065E+01	7.291E+02	1.049E+04	8.250E+06	*1.131E+15	*1.131E+15	*1.131E+15
Cs-137			6.307E+01	6.471E+01	6.811E+01	8.148E+01	1.360E+02	2.270E+02	8.168E+02	1.370E+05	2.298E+07	8.376E+12
Pu-238			8.698E+02	8.769E+02	8.912E+02	9.432E+02	1.109E+03	1.304E+03	1.955E+03	9.881E+03	4.992E+04	2.816E+06
Pu-239			7.886E+02	7.888E+02	7.892E+02	7.905E+02	7.941E+02	7.978E+02	8.070E+02	8.449E+02	8.847E+02	9.924E+02
Pu-240			7.891E+02	7.893E+02	7.898E+02	7.915E+02	7.964E+02	8.013E+02	8.137E+02	8.652E+02	9.200E+02	1.073E+03
Ra-226			1.804E+01	1.800E+01	1.793E+01	1.775E+01	1.756E+01	1.768E+01	1.852E+01	2.382E+01	3.079E+01	5.848E+01
Sr-90			2.955E+02	3.137E+02	3.533E+02	5.357E+02	1.760E+03	5.784E+03	1.132E+05	1.661E+10	*1.365E+14	*1.365E+14
U-234			4.464E+03	4.493E+03	4.552E+03	4.762E+03	5.415E+03	6.153E+03	8.440E+03	2.633E+04	5.145E+04	5.157E+04
U-235			2.673E+02	2.690E+02	2.725E+02	2.849E+02	3.234E+02	3.667E+02	4.998E+02	1.609E+03	4.161E+03	1.074E+04
U-238			1.194E+03	1.202E+03	1.217E+03	1.274E+03	1.449E+03	1.650E+03	2.279E+03	8.305E+03	3.026E+04	*3.360E+05

*At specific activity limit

Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMFOSP.DAT

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

Nuclide (j)	Parent (i)	BRP(i)	DOSE(j,t), mrem/yr <i>1/4/3</i>										
			t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00		2.267E-02	2.263E-02	2.256E-02	2.230E-02	2.157E-02	2.086E-02	1.920E-02	1.377E-02	9.876E-03	4.302E-03
Np-237	Am-241	1.000E+00		0.000E+00	5.861E-08	1.717E-07	5.281E-07	1.271E-06	1.722E-06	2.168E-06	1.793E-06	1.289E-06	5.615E-07
U-233	Am-241	1.000E+00		0.000E+00	2.762E-15	2.257E-14	2.276E-13	1.677E-12	3.866E-12	1.001E-11	2.160E-11	1.979E-11	9.677E-12
Th-229	Am-241	1.000E+00		0.000E+00	3.472E-18	9.256E-17	3.250E-15	7.594E-14	3.060E-13	1.768E-12	1.647E-11	3.373E-11	6.112E-11
Co-60	Co-60	1.000E+00		1.124E+00	9.834E-01	7.532E-01	2.962E-01	2.057E-02	1.429E-03	1.818E-06	4.761E-18	1.244E-29	0.000E+00
Cs-137	Cs-137	1.000E+00		2.378E-01	2.318E-01	2.202E-01	1.841E-01	1.103E-01	<u>6.609E-02</u>	1.836E-02	1.095E-04	6.526E-07	1.791E-12
Pu-238	Pu-238	1.000E+00		1.724E-02	1.711E-02	1.683E-02	1.590E-02	1.352E-02	1.150E-02	7.671E-03	1.518E-03	3.003E-04	5.229E-06
U-234	Pu-238	1.000E+00		0.000E+00	9.486E-09	2.799E-08	8.859E-08	2.297E-07	3.310E-07	4.602E-07	3.245E-07	1.282E-07	7.281E-09
U-234	U-234	1.000E+00		3.360E-03	3.338E-03	3.295E-03	3.149E-03	2.767E-03	2.431E-03	1.759E-03	4.825E-04	1.323E-04	5.210E-06
U-234	U-238	1.000E+00		0.000E+00	9.539E-09	2.810E-08	8.936E-08	2.354E-07	3.447E-07	4.989E-07	4.105E-07	1.877E-07	1.479E-08
U-234	EDOSE(j):			3.360E-03	3.338E-03	3.295E-03	3.150E-03	2.768E-03	2.432E-03	1.760E-03	4.832E-04	1.326E-04	5.232E-06
Th-230	Pu-238	1.000E+00		0.000E+00	8.686E-14	7.663E-13	8.201E-12	6.697E-11	1.691E-10	5.364E-10	2.074E-09	2.831E-09	3.158E-09
Th-230	U-234	1.000E+00		0.000E+00	6.091E-08	1.806E-07	5.875E-07	1.653E-06	2.588E-06	4.455E-06	7.960E-06	8.863E-06	9.021E-06
Th-230	U-238	1.000E+00		0.000E+00	8.692E-14	7.675E-13	8.245E-12	6.805E-11	1.736E-10	5.644E-10	2.360E-09	3.385E-09	3.940E-09
Th-230	EDOSE(j):			0.000E+00	6.091E-08	1.806E-07	5.875E-07	1.653E-06	2.588E-06	4.456E-06	7.964E-06	8.869E-06	9.028E-06
Ra-226	Pu-238	1.000E+00		0.000E+00	1.526E-15	4.087E-14	1.472E-12	3.675E-11	1.574E-10	1.041E-09	1.390E-08	3.460E-08	7.922E-08
Ra-226	Ra-226	1.000E+00		8.313E-01	8.303E-01	8.281E-01	8.207E-01	7.999E-01	7.797E-01	7.312E-01	5.657E-01	4.377E-01	2.304E-01
Ra-226	U-234	1.000E+00		0.000E+00	1.617E-09	1.448E-08	1.580E-07	1.351E-06	3.567E-06	1.262E-05	7.253E-05	1.366E-04	2.501E-04
Ra-226	U-238	1.000E+00		0.000E+00	1.527E-15	4.092E-14	1.478E-12	3.719E-11	1.606E-10	1.082E-09	1.533E-08	3.980E-08	9.613E-08
Ra-226	EDOSE(j):			8.313E-01	8.303E-01	8.281E-01	8.207E-01	7.999E-01	7.797E-01	7.312E-01	5.658E-01	4.378E-01	2.307E-01
Pb-210	Pu-238	1.000E+00		0.000E+00	1.902E-18	1.190E-16	1.247E-14	8.173E-13	5.268E-12	5.600E-11	1.215E-09	3.387E-09	8.357E-09
Pb-210	Ra-226	1.000E+00		0.000E+00	3.124E-03	8.425E-03	2.445E-02	5.406E-02	6.879E-02	7.869E-02	6.398E-02	4.951E-02	2.607E-02
Pb-210	U-234	1.000E+00		0.000E+00	2.483E-12	5.415E-11	1.735E-09	3.807E-08	1.476E-07	7.972E-07	6.746E-06	1.377E-05	2.656E-05
Pb-210	U-238	1.000E+00		0.000E+00	1.902E-18	1.191E-16	1.252E-14	8.254E-13	5.356E-12	5.788E-11	1.331E-09	3.877E-09	1.012E-08
Pb-210	EDOSE(j):			0.000E+00	3.124E-03	8.425E-03	2.445E-02	5.406E-02	6.879E-02	7.870E-02	6.399E-02	4.952E-02	2.609E-02
Pu-239	Pu-239	1.000E+00		1.902E-02	1.902E-02	1.901E-02	1.898E-02	1.889E-02	1.880E-02	1.859E-02	1.775E-02	1.696E-02	1.511E-02
U-235	Pu-239	1.000E+00		0.000E+00	5.509E-11	1.641E-10	5.345E-10	1.502E-09	2.347E-09	4.018E-09	6.997E-09	7.550E-09	7.028E-09
U-235	U-235	1.000E+00		5.611E-02	5.575E-02	5.503E-02	5.260E-02	4.622E-02	4.061E-02	2.939E-02	8.064E-03	2.213E-03	8.725E-05
U-235	EDOSE(j):			5.611E-02	5.575E-02	5.503E-02	5.260E-02	4.622E-02	4.061E-02	2.939E-02	8.064E-03	2.213E-03	8.726E-05
Pa-231	Pu-239	1.000E+00		0.000E+00	1.815E-15	1.614E-14	1.760E-13	1.513E-12	4.020E-12	1.444E-11	8.859E-11	1.786E-10	3.864E-10
Pa-231	U-235	1.000E+00		0.000E+00	3.662E-06	1.087E-05	3.536E-05	9.931E-05	1.552E-04	2.658E-04	4.633E-04	5.005E-04	4.677E-04
Pa-231	EDOSE(j):			0.000E+00	3.662E-06	1.087E-05	3.536E-05	9.931E-05	1.552E-04	2.658E-04	4.633E-04	5.006E-04	4.677E-04
Ac-227	Pu-239	1.000E+00		0.000E+00	3.585E-17	9.179E-16	3.145E-14	7.051E-13	2.752E-12	1.505E-11	1.349E-10	2.942E-10	6.701E-10
Ac-227	U-235	1.000E+00		0.000E+00	1.071E-07	9.180E-07	9.267E-06	6.542E-05	1.453E-04	3.546E-04	7.975E-04	8.913E-04	8.418E-04
Ac-227	EDOSE(j):			0.000E+00	1.071E-07	9.180E-07	9.267E-06	6.542E-05	1.453E-04	3.546E-04	7.975E-04	8.913E-04	8.418E-04

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 Summary : HWMF Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y
 File : HWMFOSP.DAT

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

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr / μCi/g										
			t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Pu-240	Pu-240	1.000E+00		1.901E-02	1.900E-02	1.899E-02	1.895E-02	1.884E-02	1.872E-02	1.843E-02	1.734E-02	1.630E-02	1.398E-02
U-236	Pu-240	1.000E+00		0.000E+00	9.397E-11	2.794E-10	9.091E-10	2.551E-09	3.983E-09	6.806E-09	1.172E-08	1.249E-08	1.120E-08
Th-232	Pu-240	1.000E+00		0.000E+00	2.433E-20	2.180E-19	2.384E-18	2.053E-17	5.458E-17	1.965E-16	1.216E-15	2.477E-15	5.509E-15
Ra-228	Pu-240	1.000E+00		0.000E+00	1.348E-20	3.418E-19	1.035E-17	1.746E-16	5.642E-16	2.383E-15	1.644E-14	3.415E-14	7.696E-14
Th-228	Pu-240	1.000E+00		0.000E+00	1.731E-21	1.166E-19	8.229E-18	2.129E-16	7.566E-16	3.418E-15	2.454E-14	5.133E-14	1.162E-13
Sr-90	Sr-90	1.000E+00		5.075E-02	4.782E-02	4.246E-02	2.800E-02	8.521E-03	<u>2.593E-03</u>	1.325E-04	9.033E-10	6.158E-15	7.468E-28
U-238	U-238	1.000E+00		1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.954E-04	1.954E-05

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

Appendix C

Hazardous Waste Management Facility (HWMF)

Soil Volumes and Radionuclide Concentrations

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**Soil Bore Concentrations (pCi/g)
for the Various Depth Intervals**

Cs 137 Soil Bore Concentration vs. Depth Interval

Cs 137 Concentration*	Cs 137	Cs 137	Cs 137	Cs 137
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16	14			
SB17	5.1			
SB18	21			
SB19	30			
SB20	92			
SB21	63			
SB22	324			
SB23	130			
SB24	540			
SB25	2300	82	80	
SB26	160			
SB27	23000	1000	350	131
SB29	500			
SB30	13			
SB31	33			
SB32	1300	1000	1900	110
SB33	320	280	99	
SB34	270			
SB35	44000	2.2	1400	1700
SB36	36000	330	6700	
SB37	810000	190	4700	6400
SB38	230000	7.2	27000	
SB39	38000	310	840	230
SB40	515000	2800	18000	1500
SB41	480			
SB42	1.2			
SB44	1800			
SB45	780			
SB46	70			
SB48	140			
SB50	62000	120		
SB51	9.4			
SB52	130	0.56	11	
SB55	1000			
SB56	6700			
Arithmetic Average	50720	510	5553	1678
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour.				
If no result is reported, the detected concentration was				
below the critical detection level.				

Sr 90 Soil Bore Concentrations vs. Depth Interval

Sr 90 Concentration*	Sr 90	Sr 90	Sr 90	Sr 90
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16	6			
SB17	5.1			
SB18	1.6			
SB19	1.6			
SB20	2.3			
SB21	40			
SB22	1.8			
SB23	1.2			
SB24	4.9			
SB25	26	0.04	1.1	
SB26	1.3			
SB27	210	12	0.51	0.054
SB29	62			
SB30	1.5			
SB31	1.3			
SB32	30	31	62	18
SB33	4.1	16	8.3	
SB34	6.1			
SB35	190	1	5.9	5.1
SB36	230	4.44	6.3	
SB37	1300	1.8	5.2	57
SB38	820	0.14	120	
SB39	260	6.9	5.8	2.1
SB40	410	5.1	92	1.2
SB41	45			
SB42	0.66			
SB44	19			
SB45	17			
SB46	4.7			
SB48	13			
SB50	120	2.3		
SB51	1.15			
SB52	1.8	2.7	0.16	
SB55	8.8			
SB56	90			
Arithmetic Average	112	7	28	14
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour for Cs137.				
If no result is reported, the detected concentration was				
below the critical detection level.				

U 235 Soil Bore Concentrations vs. Depth Interval

U 235 Concentration*	U 235	U 235	U 235	U 235
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
(det=detected>MDC)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16 det A	0.093			
SB17	0.78 U			
SB18	0.95 U			
SB19	2 U			
SB20	1.6 U			
SB21	0.84 U			
SB22 det A	0.034			
SB23	1.5 U			
SB24	2.7 U			
SB25	12 U	1.3 U	1.2 U	
SB26	1.6 U			
SB27	30 U	9 U	2.3 U	1.5 U
SB29	4.5 U			
SB30	0.75 U			
SB31	1.1 U			
SB32	4.5 U	4.9 U	8.2 U	2 U
SB33 det A & B	0.068	0.24	1.8 U	
SB34	2.1 U			
SB35	28 U	0.83 U	13 U	12 U
SB36 det A	0.28	0.84 U	4.7 U	
SB37	770 U	2.0U	16 U	20 U
SB38	120 U	0.7 U	33 U	
SB39	21 U	2.6 U	3.5 U	2.1 U
SB40	400 U	14 U	34 U	3.6 U
SB41	2.9 U			
SB42	0.44 U			
SB44 det A	0.13			
SB45 det A	0.053			
SB46	1.3 U			
SB48	1.6 U			
SB50	68 U	1.5 U		
SB51	0.86 U			
SB52	1.4 U	1.5 U	0.78 U	
SB55	5.1 U			
SB56	45 U			
Max. Detectable Conc.	0.28	0.24		
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour for Cs137.				
U = undetected at critical level i.e., 2 times measurement error.				

Am 241 Soil Bore Concentrations vs. Depth Interval

Am 241 Concentration*	Am 241	Am 241	Am 241	Am 241
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
(det=detected >MDC)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16				
SB17	0.63 U			
SB18	0.86 U			
SB19	7 U			
SB20	1.3 U			
SB21 det A	0.79			
SB22				
SB23	1.5 U			
SB24	0.78 U			
SB25	10 U	1 U	0.99 U	
SB26	0.43 U			
SB27	25 U	7 U	1.9 U	1.3 U
SB29	3.7 U			
SB30	0.21 U			
SB31	0.96 U			
SB32	4.3 U	4 U	6.5 U	1.7 U
SB33 det A	0.26			
SB34	2.1 U			
SB35	7.5 U	0.65 U	48 U	10 U
SB36 det A	4.5	0.88 U	18 U	
SB37	190 U	1.7 U	3.7 U	4.9 U
SB38	31 U	0.62 U	28 U	
SB39	5.8 U	2.1 U	2.9 U	1.8 U
SB40	100 U	11 U	27 U	3.1 U
SB41	2.8 U			
SB42	0.51 U			
SB44 det A	0.27			
SB45 det A	0.44			
SB46	1.5 U			
SB48	0.47 U			
SB50	57 U	1.2 U		
SB51	0.79 U			
SB52	1.4 U	5 U	0.64 U	
SB55	4.1 U			
SB56	172 U			
Max. Detectable Conc.	4.5			
* OU I FS Vol. 2 Appendix F				
** Soil Bore results at locations within 67 pCi/g Contour for Cs137				
U = undetected at critical level i.e., 2 times measurement error				

Volume Weighted Arithmetic and Geometric Average Concentrations

C-8

Volume-Weighted Arithmetic & Geometric Concentrations and Associated Sr 90 /Cs137 Ratios

Volume Weighted Averages	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	TOTAL VOLUME	
Volume vs. Depth Interval ^a	(CY)	(CY)	(CY)	(CY)	(CY)	
Depth Interval Total Volume	7800	8110	9830	5260	30800	
	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)		
Cs 137 Geometric Average Conc.	608.48	164.43	1003.81	614.97		
Sr 90 Geometric Average Conc.	14.31	2.50	6.25	2.99		
Cs 137 Arithmetic Average Conc.	50721	510	5553	1678		
Sr 90 Arithmetic Average Conc.	112.5	6.95	27.93	13.92		
Weighted Geometric Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	150	43	320	105	619	Geometric Average
Strontium 90	3.53	0.66	2.00	0.51	6.69	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0235	0.0152	0.0062	0.0049		0.0108
Weighted Arithmetic Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	12516	147	1772	287	14721	Arithmetic Average
Strontium 90	27.76	1.83	8.92	2.38	40.89	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0022	0.0125	0.0050	0.0083		0.0028

Cs 137 Concentration*	Cs 137	Cs 137	Cs 137	Cs 137
Soil Bore ID, No.**	Conc.: 0-1 ft Interval (pCi/g)	Conc.: 1-4 ft Interval (pCi/g)	Conc.: 4-8 ft Interval (pCi/g)	Conc.: 8-12 ft Interval (pCi/g)
SB16	14			
SB17	5.1			
SB18	21			
SB19	30			
SB20	92			
SB21	63			
SB22	324			
SB23	130			
SB24	540			
SB25	2300	82	80	
SB26	160			
SB27	23000	1000	350	131
SB29	500			
SB30	13			
SB31	33			
SB32	1300	1000	1900	110
SB33	320	280	99	
SB34	270			
SB35	44000	2.2	1400	1700
SB36	36000	330	6700	
SB37	810000	190	4700	6400
SB38	230000	7.2	27000	
SB39	38000	310	840	230
SB40	515000	2800	18000	1500
SB41	480			
SB42	1.2			
SB44	1800			
SB45	780			
SB46	70			
SB48	140			
SB50	62000	120		
SB51	9.4			
SB52	130	0.56	11	
SB55	1000			
SB56	6700			
Arithmetic Average	50720	510	5553	1678

* OUIFS Vol. 2 Appendix F
** Soil bore results at locations within 67 pCi/g contour.
If no result is reported, the detected concentration was below the critical detection level.

Cs137 0-1 ft	Cs137 1-4 ft	Cs137 4-8 ft	Cs137 8-12 ft
Mean	50720.73	Mean	510.16
Standard Error	27399.26	Standard Error	135.39
Median	324.00	Median	235.00
Mode	130.00	Mode	0.00
Standard Deviation	162090.31	Standard Deviation	800.59
Variance	26273268.202	Variance	641589.22
Kurtosis	16.04	Kurtosis	20.39
Skewness	3.96	Skewness	4.28
Range	809998.80	Range	2800.00
Minimum	1.20	Minimum	0.56
Maximum	810000.00	Maximum	2800.00
Sum	1775225.70	Sum	6121.96
Count	35.00	Count	12.00

Sr 90 Concentration*	Sr 90	Sr 90	Sr 90	Sr 90
Soil Bore LD, No.**	Conc.: 0-1 ft Interval (pCi/g)	Conc.: 1-4 ft Interval (pCi/g)	Conc.: 4-8 ft Interval (pCi/g)	Conc.: 8-12 ft Interval (pCi/g)
SB16	6			
SB17	5.1			
SB18	1.6			
SB19	1.6			
SB20	2.3			
SB21	40			
SB22	1.8			
SB23	1.2			
SB24	4.9			
SB25	28	0.04	1.1	
SB26	1.3			
SB27	210	12	0.51	0.054
SB29	62			
SB30	1.5			
SB31	1.3			
SB32	30	31	62	18
SB33	4.1	16	8.3	
SB34	6.1			
SB35	190	1	5.9	5.1
SB36	230	4.44	6.3	
SB37	1300	1.8	5.2	57
SB38	820	0.14	120	
SB39	260	6.9	5.8	2.1
SB40	410	5.1	92	1.2
SB41	45			
SB42	0.66			
SB44	19			
SB45	17			
SB46	4.7			
SB48	13			
SB50	120	2.3		
SB51	1.15			
SB52	1.8	2.7	0.16	
SB55	8.8			
SB56	90			
Arithmetic Average	112	7	28	14

* OUIFS Vol. 2 Appendix F
** Soil bore results at locations within 67 pCi/g contour for Cs137.
If no result is reported, the detected concentration was below the critical detection level.

Sr90 0-1 ft Stats	Sr90 1-4 ft Stats	Sr90 4-8 ft Stats	Sr90 8-12 ft Stats
Mean	112.51	Mean	6.95
Standard Error	44.16	Standard Error	1.52
Median	8.80	Median	3.57
Mode	1.30	Mode	0.00
Standard Deviation	261.26	Standard Deviation	9.00
Variance	68257.89	Variance	81.02
Kurtosis	13.67	Kurtosis	14.63
Skewness	3		

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Cs 137 Concentration*		Cs 137	Ln Cs 137	Cs 137	Ln Cs 137	Cs 137	Ln Cs 137	Cs 137	Ln Cs 137
Soil Bore ID, No.**	Conc.: 0-1 ft Interval (pCi/g)	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval (pCi/g)	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval (pCi/g)	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Interval (pCi/g)	Conc.: 8-12 ft Interval	
SB16	14	2.6391							
SB17	5.1	1.6292							
SB18	21	3.0445							
SB19	30	3.4012							
SB20	92	4.5218							
SB21	63	4.1431							
SB22	324	5.7807							
SB23	130	4.8675							
SB24	540	6.2916							
SB25	2300	7.7407	82	4.4067	80	4.3820			
SB26	160	5.0752							
SB27	23000	10.0432	1000	6.9078	350	5.8579	131	4.8752	
SB29	500	6.2146							
SB30	13	2.5649							
SB31	33	3.4965							
SB32	1300	7.1701	1000	6.9078	1900	7.5496	110	4.7005	
SB33	320	5.7683	280	5.6348	99	4.5951			
SB34	270	5.5984							
SB35	44000	10.6919	2.2	0.7885	1400	7.2442	1700	7.4384	
SB36	36000	10.4913	330	5.7991	6700	8.8099			
SB37	810000	13.6048	190	5.2470	4700	8.4553	6400	8.7641	
SB38	230000	12.3458	7.2	1.9741	27000	10.2036			
SB39	38000	10.5453	310	5.7366	840	6.7334	230	5.4381	
SB40	515000	13.1519	2800	7.9374	18000	9.7981	1500	7.3132	
SB41	480	6.1738							
SB42	1.2	0.1823							
SB44	1800	7.4955							
SB45	780	6.6593							
SB46	70	4.2485							
SB48	140	4.9416							
SB50	62000	11.0349	120	4.7875					
SB51	9.4	2.2407							
SB52	130	4.8675	0.56		11	2.3979			
SB55	1000	6.9078							
SB56	6700	8.8099							
* OUI FS Vol. 2 Appendix F									
** Soil bore results at locations within 67 pCi/g contour.									
	Cs 137 0-1ft Ln Stats		Cs 137 1-4ft Ln Stats		Cs 137 4-8ft Ln Stats		Cs 137 8-12ft Ln Stats		
	Geometric Mean	6.4110	Geometric Mean	5.1025	Geometric Mean	6.9116	Geometric Mean	6.4216	
	Standard Error	0.5719	Standard Error	0.4509	Standard Error	0.4956	Standard Error	0.4580	
	Median	5.7807	Median	5.6348	Median	7.2442	Median	6.3756	
	Mode	4.8675	Mode	0.0000	Mode	0.0000	Mode	0.0000	
	Standard Deviation	3.3837	Standard Deviation	2.1149	Standard Deviation	2.4280	Standard Deviation	1.6515	
	Variance	11.4492	Variance	4.4727	Variance	5.8954	Variance	2.7274	
	Kurtosis	-0.4266	Kurtosis	-1.5557	Kurtosis	-1.3216	Kurtosis	-1.6346	
	Skewness	0.4854	Skewness	0.5212	Skewness	0.6365	Skewness	0.4880	
	Range	13.4225	Range	7.9374	Range	10.2036	Range	8.7641	
	Minimum	0.1823	Minimum	0.7885	Minimum	2.3979	Minimum	4.7005	
	Maximum	13.6048	Maximum	7.9374	Maximum	10.2036	Maximum	8.7641	
	Sum	224.3837	Sum	56.1271	Sum	76.0271	Sum	38.5294	
	Count	35.0000	Count	11.0000	Count	11.0000	Count	6.0000	
Sr 90 Concentration*		Sr 90	Ln Sr 90	Sr 90	Ln Sr 90	Sr 90	Ln Sr 90	Sr 90	Ln Sr 90
Soil Bore ID, No.**	Conc.: 0-								

Cs 137 & Sr 90 Arithmetic Average Concentration vs. Derived Concentration Guideline Limit

Vol-Weighted Arithmetic Avg Conc. vs. Soil Cleanup Goal/Limit				
Avg Conc Excav. @ 100 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
1500 to 2800 pCi/g	2150	2020	543	
2,800 to 5,600 pCi/g	4200	3200	1680	
5,600 to 30,000 pCi/g	17800	1980	4406	
over 30,000 pCi/g	420000	800	42000	Cs 137 Concentration: Arithmetic
Total Volume		8000	48628	< Vol-Weighted Avg @ 100 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			136	< Vol-Weighted Avg @ 100 mrem
Vol-Weighted Arithmetic Avg Conc Excav. @ 75 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
1135 to 1600 pCi/g	1318	990	145	
1500 to 2800 pCi/g	2150	2020	483	
2,800 to 5,600 pCi/g	4200	3200	1495	
5,600 to 30,000 pCi/g	17800	1980	3920	
over 30,000 pCi/g	420000	800	37375	Cs 137 Concentration: Arithmetic
Total Volume		8990	43418	< Vol-Weighted Avg @ 75 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			122	< Vol-Weighted Avg @ 75 mrem
Vol-Weighted Arithmetic Avg Conc Excav. @ 25 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
378 to 1135 pCi/g	756	11210	420	
1135 to 1500 pCi/g	1318	990	65	
1500 to 2800 pCi/g	2150	2020	215	
2,800 to 5,600 pCi/g	4200	3200	665	
5,600 to 30,000 pCi/g	17800	1980	1745	
over 30,000 pCi/g	420000	800	16634	Cs 137 Concentration: Arithmetic
Total Volume		20200	19743	< Vol-Weighted Avg @ 25 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			55	< Vol-Weighted Avg @ 25 mrem
Vol-Weighted Arithmetic Avg Conc Excav. @ 15 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
227 to 378 pCi/g	302	5550	65	
378 to 1135 pCi/g	756	11210	329	
1135 to 1500 pCi/g	1318	990	51	
1500 to 2800 pCi/g	2150	2020	169	
2,800 to 5,600 pCi/g	4200	3200	522	
5,600 to 30,000 pCi/g	17800	1980	1369	
over 30,000 pCi/g	420000	800	13049	Cs 137 Concentration: Arithmetic
Total Volume		25750	15553	< Vol-Weighted Avg @ 15 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			44	< Vol-Weighted Avg @ 15 mrem
Vol-Weighted Arithmetic Avg Conc Excav. @ 1 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
15 to 227 pCi/g	121	52542	81	
227 to 378 pCi/g	302	5550	21	
378 to 1135 pCi/g	756	11210	108	
1135 to 1500 pCi/g	1318	990	17	
1500 to 2800 pCi/g	2150	2020	55	
2,800 to 5,600 pCi/g	4200	3200	172	
5,600 to 30,000 pCi/g	17800	1980	450	
over 30,000 pCi/g	420000	800	4292	Cs 137 Concentration: Arithmetic
Total Volume		78292	5196	< Vol-Weighted Avg @ 1 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			16	< Vol-Weighted Avg @ 1 mrem

Cs 137 & Sr 90 Geometric Average Concentration vs. Derived Concentration Guideline Limit

Vol Weighted Geometric Avg vs. Soil Cleanup Goal/Limit					
Avg Conc Excav. @ 100 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
1500 to 2800 pCi/g	2150	7.67	2020	1.94	
2,800 to 5,600 pCi/g	4200	8.34	3200	3.34	
5,600 to 30,000 pCi/g	17800	9.79	1980	2.42	
over 30,000 pCi/g	420000	12.95	800	1.29	Cs 137 Concentration: Geometric
	Total Volume >		8000	8036	< Vol-Weighted Avg @ 100 mrem
Strontium 90					
					87 < Vol-Weighted Avg @ 100 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 75 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
1135 to 1500 pCi/g	1318	7.18	990	0.79	
1500 to 2800 pCi/g	2150	7.67	2020	1.72	
2,800 to 5,600 pCi/g	4200	8.34	3200	2.97	
5,600 to 30,000 pCi/g	17800	9.79	1980	2.16	
over 30,000 pCi/g	420000	12.95	800	1.15	Cs 137 Concentration: Geometric
	Total Volume >		8990	6585	< Vol-Weighted Avg @ 75 mrem
Strontium 90					
					71 < Vol-Weighted Avg @ 75 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 25 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
378 to 1135 pCi/g	756	6.63	11210	3.68	
1135 to 1500 pCi/g	1318	7.18	990	0.35	
1500 to 2800 pCi/g	2150	7.67	2020	0.77	
2,800 to 5,600 pCi/g	4200	8.34	3200	1.32	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.96	
over 30,000 pCi/g	420000	12.95	800	0.51	Cs 137 Concentration: Geometric
	Total Volume >		20200	1981	< Vol-Weighted Avg @ 25 mrem
Strontium 90					
					21 < Vol-Weighted Avg @ 25 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 15 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
227 to 378 pCi/g	302	5.71	5550	1.23	
378 to 1135 pCi/g	756	6.63	11210	2.89	
1135 to 1500 pCi/g	1318	7.18	990	0.28	
1500 to 2800 pCi/g	2150	7.67	2020	0.60	
2,800 to 5,600 pCi/g	4200	8.34	3200	1.04	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.75	
over 30,000 pCi/g	420000	12.95	800	0.40	Cs 137 Concentration: Geometric
	Total Volume >		25750	1321	< Vol-Weighted Avg @ 15 mrem
Strontium 90					
					14 < Vol-Weighted Avg @ 15 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 1 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
15 to 227 pCi/g	121	4.80	52542	3.22	
227 to 378 pCi/g	302	5.71	5550	0.40	
378 to 1135 pCi/g	756	6.63	11210	0.95	
1135 to 1500 pCi/g	1318	7.18	990	0.09	
1500 to 2800 pCi/g	2150	7.67	2020	0.20	
2,800 to 5,600 pCi/g	4200	8.34	3200	0.34	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.25	
over 30,000 pCi/g	420000	12.95	800	0.13	Cs 137 Concentration: Geometric
	Total Volume >		78292	266	< Vol-Weighted Avg @ 1 mrem
Strontium 90					
					3 < Vol-Weighted Avg @ 1 mrem

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Soil Volumes, Areas, and
Lengths Parallel to the Aquifer Flow
vs.
Depth Intervals

HWMF Soil Volumes and Areas vs. Depth Interval

Differential Volumes vs. Cs 137 Derived Concentration Guideline Limit Interval	Strontium 90	Cesium 137	Concentration	Concentration	Cummulative Volume	Cummulative Volume	Total
Soil Cleanup Limit/Goals (mrem/yr)	DCGL (pCi/g)	DCGL (pCi/g)	@ DCGL Upper Limit (pCi/g)	@ DCGL Lower Limit (pCi/g)	@ DCGL Upper Limit * (CY)	@ DCGL Lower Limit (CY)	Cesium-137 Differential Volume (CY)
100	38556	1513	810000	1513	188	8000	7812
75	28920	1135	1513	1135	8000	8990	990
25	9636	378	1135	378	8990	20200	11210
15	5784	227	378	227	20200	25750	5550
1	386	15	227	15	25750	78292	52542
* Volume for Cs 137 > 810000pCi/g = 352792(Conc.)-0.554		Volume for Cs 137 15 pCi/g = 352792(Conc.)-0.554				TOTAL VOLUME >	78103
Cs 137 Volumes vs. Depth Interval *	Interval A Surface Area: 0-1 ft	Interval A Vol.: 0-1 ft	Interval B Vol.: 1-4 ft	Interval C Vol.: 4-8 ft	Interval D Vol.: 8-12 ft	Total Vol.: 0-12 ft	
Soil Concentration Interval	(SY)	(CY)	(CY)	(CY)	(CY)	(CY)	
67 to 600 pCi/g	10600	3530	5330	6120	3810	18790	
600 to 2,800 pCi/g	5750	1920	1590	2120	400	6030	
2,800 to 5,600 pCi/g	1860	620	690	840	1050	3200	
5,600 to 30,000 pCi/g	2190	730	500	750	0	1980	
over 30,000 pCi/g	2400	800	0	0	0	800	
Total Interval Surface Area or Vol.	22800	7600	8110	9830	5260	30800	< TOTAL VOLUME
*BNL's OU I FS Appendix F Table F-3							
Cs 137 Surface Area vs. Depth Interval *	Interval A Surface Area: 0-1 ft	Interval B Vol.: 1-4 ft	Interval C Vol.: 4-8 ft	Interval D Vol.: 8-12 ft			
	(SY)	(SY)	(SY)	(SY)			
Total Interval Contaminated Area	22800	8131	7387	3961			
*BNL's OU I FS Appendix F Table F-3							
Length of Parallel to Direction of Aquifer Flow*	Interval A Length: 0-1 ft	Interval B Length: 1-4 ft	Interval C Length: 4-8 ft	Interval D Length: 8-12 ft			
	(Feet)	(Feet)	(Feet)	(Feet)			
Depth Interval Length of Parallel	530	200	220	210			
* Lengths scaled from Fig. A5 to 8 in BNL's OU I FS Appendix A

EXHIBIT 1 - power curve
Total Volume of Contaminated Soil in HWMF Vs. Cs-137 Level
(excludes debris & mixed waste)

JOHANN, JIMENEZ

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HWMF
WETLAND
BOUNDARY

B-37AA AOC-1H

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AOC-1G

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FIGURE A-5
HWMF — ESTIMATED AREA OF CONTAMINATED SOILS
"A" HORIZON (0-0.5ft bgs)

CDM FEDERAL PROGRAMS CORPORATION
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HWMF - ESTIMATED AREA OF CONTAMINATED SOILS "B" HORIZON (1-3ft bgs) OUI FS Brookhaven National Laboratory, Upton, New York

CDM FEDERAL PROGRAMS CORPORATION
 a subsidiary of Camp Dresser & McKee Inc.

FIGURE A-7
HWMF — ESTIMATED AREA OF CONTAMINATED SOILS
"C" HORIZON (4-6ft bgs)

FIGURE A-8
HWMF — ESTIMATED AREA OF CONTAMINATED SOILS
"D" HORIZON (8-10ft bgs)

Appendix D

Dose to Workers from Environmental Remediation

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Remediation Goals using Arithmetic
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Remediation Workers: Collective Doses to
Remediate to the Various Risk-Based
Remediation Goals using Geometric
Averages D-13

Remediation Workers: Dose Impacts
Associated with Remediation D-21

**Present Workers: Dose Savings Associated with
Initial Radiological Conditions and Those after
Remediation**

D-2

Present Worker Dose Savings: Without and With Remediation									
Present Worker without Remediation	Dose/ Exposure Factor	Exposure Rate	Sampling Time	Integrated Decay Factor	No. Persons Exposed	Sampling Frequency	Conv. Factor	Collective Dose	
	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	(Person-rem)	
Dose for MW 88-03	0.813	0.400	1	37.630	2	4	0.001	0.110	
Dose for MW 88-04	0.813	0.300	1	37.630	2	4	0.001	0.082	
Dose for MW 88-24	0.813	15.000	1	37.630	2	4	0.001	4.123	
						Total >		4.315	
Present Worker with Remediation	Dose/ Exposure Factor	Exposure Rate	Sampling Time	Integrated Decay Factor	No. Persons Exposed	Sampling Frequency	Conv. Factor	Collective Dose	
	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	(Person-rem)	
Dose to 1 mrem for 3 MWs	1.000	0.003	1	35.680	2	12	0.003	0.224	0.227
Dose to 15 mrem for 3 MWs	1.000	0.050	1	35.680	2	12	0.001	0.043	0.224
Dose to 25mrem for 3 MWs	1.000	0.100	1	35.680	2	12	0.001	0.086	0.224
Dose to 75 mrem for 3 MWs	1.000	0.250	1	35.680	2	12	0.001	0.214	0.224
Dose to 100 mrem for 3 MWs	1.000	0.330	1	35.680	2	12	0.001	0.263	0.224
									0.507
Annual Collective Dose for 1986 or 1997	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	(Person-rem)	
Dose for MW 88-03	0.813	0.40	1	0.976	2	4	0.001	0.003	
Dose for MW 88-04	0.813	0.30	1	0.976	2	4	0.001	0.002	
Dose for MW 88-24	0.813	15.00	1	0.976	2	4	0.001	0.107	
Present Worker Collective Dose Savings	Worker Dose w/o Remediation	Worker Dose w Remediation	Worker Dose Averied					Total >	
	(Person-rem)	(Person-rem)	(Person-rem)					0.112	
Dose to 1 mrem for 3 MWs	4.32	0.23	4.09						
Dose to 15 mrem for 3 MWs	4.32	0.27	4.05						
Dose to 25mrem for 3 MWs	4.32	0.31	4.01						
Dose to 75 mrem for 3 MWs	4.32	0.44	3.89						
Dose to 100 mrem for 3 MWs	4.32	0.51	3.81						

File: WRKDOSE wb3

Remediation Workers: Collective Doses to
Remediate to the Various Risk-Based
Remediation Goals using Arithmetic Averages

Dose to Workers from Environmental Remediation to 100 mrem/yr; Volume-Weighted Arithmetic Average Concentrations										File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.									
Cleanup to 100 mrem/yr	RSC	DCF Inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)
Strontium-90	138	1.310E-03	1.2	1.62	6117	0.0004	0.001	8.474E-04	0.1	8.47E-05
Cesium-137	48628	3.190E-05	1.2	1.62	6117	0.0004	0.001	7.378E-03	0.1	7.38E-04
								8.23E-03		8.23E-04
										Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density							
Cleanup to 100 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose		
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)		
Strontium-90	138	0.000E+00	0.98	1.62	6117	0.000114	0.001	0.000E+00		
Cesium-137	48628	3.605E+00	0.98	1.62	6117	0.000114	0.001	1.909E+02		
								1.909E+02		Total External Dose (Person-rem)

[illegible]

Dose to Workers from Environmental Remediation to 25 mrem/yr:											
Volume-Weighted Airborne Average Concentrations											
Dose from Inhalation	Artificially Avg.										
Radonucleide	RSC (pCi/g)	DCF Inh	IR	Excavate & Package	Soil Volume (m3)	DL (g/m3)	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Cleanup to 25 mrem/yr			(m3/yr)	(Person hr/m3)	15445	0.0004	0.001	8.65E-04 (person-rem)	0.1	8.65E-05 (person-rem)	
Strontium-90	55	1.310E-03 (mrem/pCi)	1.2	1.62	15445	0.0004	0.001	7.564E-03		7.56E-04	
Cesium-137	19743	3.180E-05						8.43E-03		8.43E-04	Total Inhalation Dose (Person-rem)
External Dose	Artificially Avg.										
Radonucleide	RSC (pCi/g)	DCF ext	Soil Density	Excavate & Package	Soil Volume (m3)	Time Conversion	Conversion Factor	External Dose			
Cleanup to 25 mrem/yr			Correction	(Person hr/m3)	15445	0.000114	0.001	1.857E+02 (person-rem)			
Strontium-90	55	0.000E+00 (mrem/yr per pCi/g)	0.98	1.62	15445	0.000114	0.001	1.857E+02			
Cesium-137	19743	3.605E+00						1.857E+02			Total External Dose (Person-rem)

File: WRKDOSE.wb3

Dose to Workers from Environmental Remediation to 15 mrem/yr: Volume-Weighted Arithmetic Average Concentrations										
										File: WRKDOSE.vb3
Dose from Inhalation Cleanup to 15 mrem/yr	Arithmetic Avg. RSC	DCF Inh (mrem/pCi)	IR (m3/hr)	Excavate & Package (Person hr/ m3)	Soil Volume (m3)	DL (g/m3)	Conversion Factor rem/mrem	Inhalation Dose w/o Resp. (person-rem)	Respirator PF	Inhalation Dose with Resp. (person-rem)
Radionuclide	(pCi/g)									
Strontium-90	44	1.310E-03	1.2	1.62	19888	0.0004	0.001	8.825E-04	0.1	8.82E-05
Cesium-137	15553	3.190E-05	1.2	1.62	19888	0.0004	0.001	7.588E-03	0.1	7.60E-04
								8.48E-03		8.48E-04
										Total Inhalation Dose (Person-rem)
External Dose Cleanup to 15 mrem/yr	Arithmetic Avg. RSC	DCF ext (mrem/yr per pCi/g)	Soil Density Correction dimensionless	Excavate & Package (Person hr/ m3)	Soil Volume (m3)	Time Conversion yr/person hr	Conversion Factor rem/mrem	External Dose (person-rem)		
Radionuclide	(pCi/g)									
Strontium-90	44	0.000E+00	0.86	1.62	19888	0.000114	0.001	0.000E+00		
Cesium-137	15553	3.605E+00	0.86	1.62	19888	0.000114	0.001	1.985E+02		
								1.985E+02	Total External Dose (Person-rem)	

Remediation Workers: Collective Doses to
Remediate to the Various Risk-Based
Remediation Goals using Geometric Averages

Dose to Workers from Environmental Remediation to 100 mrem/yr: Volume-Weighted Geometric Average Concentrations											
Dose from Inhalation Cleanup to 100 mrem/yr	Geometric										
	RSC (pCi/g)	DCF inh (mrem/pCi)	IR (m3/hr)	Excavate & Package (Person hr/ m3)	Soil Volume (m3)	DL (g/m3)	Conversion Factor rem/mrem	Inhalation Dose w/o Resp. (person-rem)	Respirator PF	Inhalation Dose with Resp. (person-rem)	
	Radionuclide										
	Strontium-90	87	1.310E-03	1.62	6117	0.0004	0.001	5.421E-04	0.1	5.42E-05	
	Cesium-137	8039	3.180E-03	1.62	6117	0.0004	0.001	1.219E-03	0.1	1.22E-04	
								1.76E-03		1.76E-04	Total Inhalation Dose (Person-rem)

File: WRKDOSE.wb3

Dose to Workers from Environmental Remediation to 75 mrem/yr:										
Volume-Weighted Geometric Average Concentrations										
Dose from Inhalation	Geometric									
Cleanup to 75 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose	Respirator PF	Inhalation Dose with Resp.
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)
Strontium-90	71	1.310E-03	1.2	1.62	6674	0.0004	0.001	4.971E-04	0.1	4.97E-05
Cesium-137	6585	3.190E-05	1.2	1.62	6674	0.0004	0.001	1.123E-03	0.1	1.12E-04
								1.62E-03		1.62E-04
										Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density							
Cleanup to 75 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose		
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)		
Strontium-90	71	0.000E+00	0.98	1.62	6674	0.000114	0.001	0.000E+00		
Cesium-137	6585	3.605E+00	0.98	1.62	6674	0.000114	0.001	2.905E+01		
								2.905E+01	Total External Dose (Person-rem)	

File: WRKDOSE.wb3

Dose to Workers from Environmental Remediation to 25 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											
Dose from Inhalation	Geometric	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.
Radonunda	(pcf/g)	(mrem/pcf)	(m2/hr)	1.2	1.62	15445	(g/m3)	0.004	3.304E-04	0.1	3.30E-05
Strontium-90	21	1.310E-03				15445		0.001	7.590E-04		7.59E-05
Cesium-137	1881	3.190E-05		1.2	1.62	15445		0.001	1.09E-03	0.1	1.09E-04
External Dose											Total Inhalation Dose (Person-rem)
Clearup to 25 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radonunda	(pcf/g)	(mrem/yr per pcf/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	21	0.000E+00	0.88	1.62	15445	0.000114	0.001	1.983E+01			
Cesium-137	1881	3.605E+00	0.88	1.62	15445	0.000114	0.001	1.983E+01	Total External Dose (Person-rem)		

File: VRKDOSE.wb3

Dose to Workers from Environmental Remediation to 15 mrem/yr: Volume-Weighted Geometric Average Concentrations										
File: WRKDOSE.wb3										
Dose from Inhalation	Geometric									
Cleanup to 15 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)
Strontium-90	14	1.310E-03	1.2	1.62	19688	0.0004	0.001	2.808E-04	0.1	2.81E-05
Cesium-137	1321	3.190E-05	1.2	1.62	19688	0.0004	0.001	6.452E-04	0.1	6.45E-05
								9.26E-04		9.26E-06
										Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density							
Cleanup to 15 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose		
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)		
Strontium-90	14	0.000E+00	0.96	1.62	19688	0.000114	0.001	0.000E+00		
Cesium-137	1321	3.605E+00	0.96	1.62	19688	0.000114	0.001	1.669E+01		
									Total External Dose (Person-rem)	

Dose to Workers from Environmental Remediation to 1 mrem/yr: Volume-Weighted Geometric Average Concentrations										
Dose from Inhalation	Geometric									
Cleanup to 1 mrem/yr	RSC	DCF Inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.
Radionuclide	(pCi/g)	(mrem/pCi)	(m ³ /hr)	(Person hr/ m ³)	(m ³)	(g/m ³)	rem/mrem	(person-rem)		(person-rem)
Strontium-90	3	1.310E-03	1.2	1.62	59862	0.0004	0.001	1.829E-04	0.1	1.83E-05
Cesium-137	268	3.190E-05	1.2	1.62	59862	0.0004	0.001	3.950E-04	0.1	3.95E-05
								5.78E-04		5.78E-05
										Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density							
Cleanup to 10 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose		
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m ³)	(m ³)	yr/person hr	rem/mrem	(person-rem)		
Strontium-90	3	0.000E+00	0.98	1.62	59862	0.000114	0.001	0.000E+00		
Cesium-137	268	3.605E+00	0.98	1.62	59862	0.000114	0.001	1.022E+01		
								1.022E+01	Total External Dose (Person-rem)	

File: WRKDOSE.wb3

Remediation Workers: Dose Impacts Associated with Remediation

Dose Impacts to Workers form Remediation

Worker Collective Dose Impacts	Remediation Workers	Disposal Workers /Drivers	Worker Dose Impact
Geometric Average Concentration	(person-rem)	(person-rem)	(person-rem)
Dose to 1 mrem/yr	10	0.94	10.9
Dose to 15 mrem/yr	17	0.92	17.9
Dose to 25mrem/yr	20	0.91	20.9
Dose to 75 mrem/yr	29	0.88	29.9
Dose to 100 mrem/yr	32	0.87	32.4
Worker Collective Dose Impacts	Remediation Workers	Disposal Workers /Drivers	Worker Dose Impact
Arithmetic Average Concentration	(person-rem)	(person-rem)	(person-rem)
Dose to 1 mrem/yr	203	19.6	223
Dose to 15 mrem/yr	199	19.2	218
Dose to 25mrem/yr	199	19.1	218
Dose to 75 mrem/yr	195	18.4	213
Dose to 100 mrem/yr	194	18.3	212

Appendix E

Dose to Workers from Transport and Disposal of Contaminated Soil: Microshield Printouts and Spreadsheets

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Contaminated Soil: Microshield Printouts. . E-9

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Contaminated Soil: Spreadsheets E-19

Dose to Workers from Disposal of
Contaminated Soil: Spreadsheets E-27

Dose to Workers from Transport of Contaminated Soil: Microshield Printouts

Page : 1
DOS File : B25CDRIV.MS5
Run Date: June 1, 1997
Run Time: 11:10:27 AM
Duration : 00:00:26

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CDRIV
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Driver @ 12 ft
Geometry: 13 - Rectangular Volume

Source Dimensions		
Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points			
# 1	X 853.44 cm 28 ft 0.0 in	Y 60.96 cm 2 ft	Z 91.44 cm 3 ft

Shields			
Shield Name	Dimension	Material	Density
Source	384.0 ft ³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results					
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	3.408e-19	1.080e-18	2.838e-21	8.993e-21
0.0322	2.428e+04	1.663e-18	5.388e-18	1.338e-20	4.336e-20
0.0364	8.835e+03	2.719e-15	1.123e-14	1.545e-17	6.379e-17
0.6616	5.719e+05	1.735e-03	4.861e-03	3.363e-06	9.423e-06
TOTALS:	6.182e+05	1.735e-03	4.861e-03	3.363e-06	9.423e-06

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CDRIV.MS5
Case Title: B25CDRIV
This case was run on Sunday, June 1, 1997 at 11:10:27 AM
Dose Point # 1 - (28,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	2.622e-003	7.346e-003
Photon Energy Fluence Rate	MeV/cm ² /sec	1.735e-003	4.861e-003
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	3.363e-006	9.423e-006
Absorbed Dose Rate in Air	mGy/hr	2.936e-008	8.226e-008
"	mrads/hr	2.936e-006	8.226e-006
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.476e-008	9.739e-008
o Opposed	"	2.783e-008	7.798e-008
o Rotational	"	2.783e-008	7.798e-008
o Isotropic	"	2.461e-008	6.895e-008
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.695e-008	1.035e-007
o Opposed	"	3.509e-008	9.832e-008
o Rotational	"	3.509e-008	9.832e-008
o Isotropic	"	2.631e-008	7.371e-008
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	3.074e-008	8.612e-008
o Posterior/Anterior	"	2.713e-008	<u>7.601e-008</u>
o Lateral	"	2.012e-008	5.637e-008
o Rotational	"	2.425e-008	6.793e-008
o Isotropic	"	2.064e-008	5.783e-008

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Custom Material : NBS Concrete
NBS Concrete
Density : 2.35 g/cm³
Average Atomic Number : 14 (based on average elements Z)
Effective Atomic Number : 11.58 (for Buildup Factor Interpolation)
Effective Atomic Weight : 18.8

	<u>Hydrogen</u> <u>0.560%</u>	<u>Oxygen</u> <u>49.830%</u>	<u>Sodium</u> <u>1.710%</u>	<u>Magnesium</u> <u>0.240%</u>	<u>Aluminum</u> <u>4.560%</u>	<u>Silicon</u> <u>31.580%</u>	<u>Sulfur</u> <u>0.120%</u>	<u>Potassium</u> <u>1.920%</u>	<u>Calcium</u> <u>8.260%</u>	<u>Iron</u> <u>1.220%</u>
Hydrogen	1									
Oxygen		1								
Sodium			1							
Magnesium				1						
Aluminum					1					
Silicon						1				
Sulfur							1			
Potassium								1		
Calcium									1	
Iron										1

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
 DOS File : B25SDRIV.MS5
 Run Date : June 1, 1997
 Run Time: 11:06:44 AM
 Duration : 00:00:25

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: B25SDRIVER
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Driver @ 12 Ft.
Geometry: 13 - Rectangular Volume

Source Dimensions			
Length	487.68 cm	16 ft	
Width	182.88 cm	6 ft	
Height	121.92 cm	4 ft	

Dose Points			
# 1	<u>X</u> 853.44 cm 28 ft 0.0 in	<u>Y</u> 60.96 cm 2 ft	<u>Z</u> 91.44 cm 3 ft

Shields			
Shield Name	Dimension	Material	Density
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded

Library : Grove				
Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results					
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.836e-18	1.701e-17	2.362e-20	1.417e-19
0.0322	2.428e+04	1.294e-17	7.970e-17	1.041e-19	6.414e-19
0.0364	8.835e+03	1.189e-14	9.657e-14	6.758e-17	5.487e-16
0.6616	5.719e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05
TOTALS:	6.182e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25SDRIV.MS5
Case Title: B25SDRIVER
This case was run on Sunday, June 1, 1997 at 11:06:44 AM
Dose Point # 1 - (28,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	3.590e-003	1.033e-002
Photon Energy Fluence Rate	MeV/cm ² /sec	2.375e-003	6.834e-003
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.605e-006	1.325e-005
Absorbed Dose Rate in Air	mGy/hr	4.020e-008	1.157e-007
"	mrads/hr	4.020e-006	1.157e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.759e-008	1.369e-007
o Opposed	"	3.811e-008	1.096e-007
o Rotational	"	3.811e-008	1.096e-007
o Isotropic	"	3.370e-008	9.695e-008
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.058e-008	1.455e-007
o Opposed	"	4.804e-008	1.382e-007
o Rotational	"	4.804e-008	1.382e-007
o Isotropic	"	3.602e-008	1.036e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	4.208e-008	1.211e-007
o Posterior/Anterior	"	3.715e-008	<u>1.069e-007</u>
o Lateral	"	2.755e-008	<u>7.925e-008</u>
o Rotational	"	3.319e-008	9.551e-008
o Isotropic	"	2.826e-008	8.131e-008

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Custom Material : BNL Soil
BNL Soil w 18% Moisture
Density : 1.67 g/cm³
Average Atomic Number : 6.67 (based on average elements Z)
Effective Atomic Number : 10.16 (for Buildup Factor Interpolation)
Effective Atomic Weight : 14.1

	<u>SiO2</u> <u>82.000%</u>	<u>H2O</u> <u>18.000%</u>
Hydrogen		2
Oxygen	2	1
Silicon	1	

Dose to Workers from Disposal of Contaminated Soil: Microshield Printouts

File Ref: _____
Date: _____
By: _____
Checked: _____

Page : 1
DOS File : 1B256FT.MS5
Run Date : June 20, 1997
Run Time: 6:50:18 PM
Duration : 00:00:24

Case Title: B25CFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Transit 6 ft
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	121.92 cm	4 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	182.88 cm 6 ft	60.96 cm 2 ft	91.44 cm 3 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	96.0 ft ³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input

Grouping Method : Actual Photon Energies

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	4.2946e-006	1.5890e+005	1.5798e-006	5.8453e-002
Cs-137	4.5398e-006	1.6797e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	3.290e+03	3.796e-18	1.175e-17	3.162e-20	9.790e-20
0.0322	6.070e+03	1.741e-17	5.513e-17	1.401e-19	4.436e-19
0.0364	2.209e+03	1.818e-14	7.323e-14	1.033e-16	4.161e-16
0.6616	1.430e+05	2.559e-02	7.224e-02	4.960e-05	1.401e-04
TOTALS:	1.545e+05	2.559e-02	7.224e-02	4.960e-05	1.401e-04

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\1B256FT.MS5
Case Title: B25CFORK
This case was run on Friday, June 20, 1997 at 6:50:18 PM
Dose Point # 1 - (6,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	3.867e-002	1.092e-001
Photon Energy Fluence Rate	MeV/cm ² /sec	2.559e-002	7.224e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.960e-005	1.401e-004
Absorbed Dose Rate in Air	mGy/hr	4.330e-007	1.223e-006
"	mrads/hr	4.330e-005	1.223e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.127e-007	1.448e-006
o Opposed	"	4.105e-007	1.159e-006
o Rotational	"	4.105e-007	1.159e-006
o Isotropic	"	3.630e-007	1.025e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.449e-007	1.539e-006
o Opposed	"	5.175e-007	1.461e-006
o Rotational	"	5.175e-007	1.461e-006
o Isotropic	"	3.880e-007	1.096e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	4.533e-007	1.280e-006
o Posterior/Anterior	"	4.001e-007	1.130e-006
o Lateral	"	2.967e-007	8.378e-007
o Rotational	"	3.576e-007	1.010e-006
o Isotropic	"	3.044e-007	8.595e-007

Page : 1
DOS File : 4B256FT.MS5
Run Date : June 20, 1997
Run Time : 6:55:10 PM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Pick @ 6 ft
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	670.56 cm 22 ft	60.96 cm 2 ft	91.44 cm 3 ft

Shields

Shield Name	Dimension	Material	Density
Source	1.09e+07 cm³	NBS Concrete	2.35
Shield 1	.476 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input

Grouping Method : Standard Indices

Number of Groups : 4

Lower Energy Cutoff : 0.015

Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm²/sec No Buildup	MeV/cm²/sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.0318	1.316e+04	6.406e-19	2.037e-18	5.336e-21	1.697e-20
0.0322	2.428e+04	3.169e-18	1.030e-17	2.550e-20	8.292e-20
0.0364	8.835e+03	5.936e-15	2.468e-14	3.372e-17	1.402e-16
0.6616	5.719e+05	6.105e-03	1.684e-02	1.184e-05	3.265e-05
TOTALS:	6.182e+05	6.105e-03	1.684e-02	1.184e-05	3.265e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\4B256FT.MS5
Case Title: B25CFORK
This case was run on Friday, June 20, 1997 at 6:55:10 PM
Dose Point # 1 - (670.56,60.96,91.44) cm

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	9.227e-003	2.546e-002
Photon Energy Fluence Rate	MeV/cm ² /sec	6.105e-003	1.684e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.184e-005	3.265e-005
Absorbed Dose Rate in Air	mGy/hr	1.033e-007	2.851e-007
"	mrad/hr	1.033e-005	2.851e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.223e-007	3.375e-007
o Opposed	"	9.795e-008	2.702e-007
o Rotational	"	9.795e-008	2.702e-007
o Isotropic	"	8.661e-008	2.389e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.300e-007	3.587e-007
o Opposed	"	1.235e-007	3.407e-007
o Rotational	"	1.235e-007	3.407e-007
o Isotropic	"	9.259e-008	2.554e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	1.082e-007	2.984e-007
o Posterior/Anterior	"	9.548e-008	2.634e-007
o Lateral	"	7.080e-008	1.953e-007
o Rotational	"	8.532e-008	2.354e-007
o Isotropic	"	7.264e-008	2.004e-007

Page : 1
DOS File : 1B25S6FT.MS5
Run Date : June 20, 1997
Run Time : 7:07:05 PM
Duration : 00:00:24

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Transit @ 6 Ft.
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	121.92 cm	4 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	182.88 cm 6 ft	60.96 cm 2 ft	91.44 cm 3 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	96.0 ft ³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input

Grouping Method : Actual Photon Energies

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	4.2946e-006	1.5890e+005	1.5798e-006	5.8453e-002
Cs-137	4.5398e-006	1.6797e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	3.290e+03	8.504e-18	5.072e-17	7.084e-20	4.225e-19
0.0322	6.070e+03	3.874e-17	2.375e-16	3.118e-19	1.911e-18
0.0364	2.209e+03	3.821e-14	3.122e-13	2.171e-16	1.774e-15
0.6616	1.430e+05	3.474e-02	9.970e-02	6.734e-05	1.933e-04
TOTALS:	1.545e+05	3.474e-02	9.970e-02	6.734e-05	1.933e-04

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\1B25S6FT.MS5
Case Title: B25SFORK
This case was run on Friday, June 20, 1997 at 7:07:05 PM
Dose Point # 1 - (6,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	5.250e-002	1.507e-001
Photon Energy Fluence Rate	MeV/cm ² /sec	3.474e-002	9.970e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	6.734e-005	1.933e-004
Absorbed Dose Rate in Air	mGy/hr	5.879e-007	1.687e-006
"	mrad/hr	5.879e-005	1.687e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.960e-007	1.998e-006
o Opposed	"	5.573e-007	1.599e-006
o Rotational	"	5.573e-007	1.599e-006
o Isotropic	"	4.928e-007	1.414e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.398e-007	2.123e-006
o Opposed	"	7.026e-007	2.017e-006
o Rotational	"	7.026e-007	2.017e-006
o Isotropic	"	5.268e-007	1.512e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	6.155e-007	1.766e-006
o Posterior/Anterior	"	5.432e-007	1.559e-006
o Lateral	"	4.028e-007	1.156e-006
o Rotational	"	4.854e-007	1.393e-006
o Isotropic	"	4.133e-007	1.186e-006

Page : 1
DOS File : 4B25S6FT.MS5
Run Date : June 20, 1997
Run Time : 7:02:01 PM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Pick @ 6 Ft.
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	670.56 cm 22 ft 0.0 in	60.96 cm 2 ft	91.44 cm 3 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	384.0 ft ³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input

Grouping Method : Standard Indices

Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	5.507e-18	3.325e-17	4.587e-20	2.769e-19
0.0322	2.428e+04	2.546e-17	1.579e-16	2.049e-19	1.271e-18
0.0364	8.835e+03	2.674e-14	2.195e-13	1.519e-16	1.247e-15
0.6616	5.719e+05	8.307e-03	2.342e-02	1.610e-05	4.541e-05
TOTALS:	6.182e+05	8.307e-03	2.342e-02	1.610e-05	4.541e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\4B25S6FT.MS5

Case Title: B25SFORK

This case was run on Friday, June 20, 1997 at 7:02:01 PM

Dose Point # 1 - (22,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	1.256e-002	3.540e-002
Photon Energy Fluence Rate	MeV/cm ² /sec	8.307e-003	2.342e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.610e-005	4.541e-005
Absorbed Dose Rate in Air	mGy/hr	1.406e-007	3.964e-007
"	mrads/hr	1.406e-005	3.964e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.665e-007	4.693e-007
o Opposed	"	1.333e-007	3.758e-007
o Rotational	"	1.333e-007	3.758e-007
o Isotropic	"	1.179e-007	3.323e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.769e-007	4.988e-007
o Opposed	"	1.680e-007	4.738e-007
o Rotational	"	1.680e-007	4.738e-007
o Isotropic	"	1.260e-007	3.552e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	1.472e-007	4.150e-007
o Posterior/Anterior	"	1.299e-007	3.663e-007
o Lateral	"	9.634e-008	2.716e-007
o Rotational	"	1.161e-007	3.273e-007
o Isotropic	"	9.884e-008	2.787e-007

Dose to Workers from Transport of Contaminated Soil: Spreadsheets

E-21

01-Mar-97

Dose to Driver/Worker from Transport and Off-site Disposal to 100 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate@12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	44	2	498	0.767	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00000760	48246	44	2	498	16.069	Dose w Arithmetic Avg.
Dose from Transport to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	103	35	2	168	0.013	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00001070	2150	35	2	168	0.271	Dose w Arithmetic Avg.

Dose to Driver/Worker from Transport and Off-site Disposal to 75 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford Cleanup to 75 mrem/yr	B-25C Dose Rate@12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	44	2	498	0.767	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00000760	48246	44	2	498	16.069	Dose w Arithmetic Avg.
Dose from Transport to Envirocare Cleanup to 75 mrem/yr	B-25S Dose Rate @ 12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	90	35	2	250	0.017	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00001070	1876	35	2	250	0.351	Dose w Arithmetic Avg.

Dose to Driver/Worker from Transport and Off-site Disposal to 25 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate@12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	44	2	498	0.767	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00000760	48246	44	2	498	16.069	Dose w Arithmetic Avg.
Dose from Transport to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	47	35	2	1185	0.042	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00001070	993	35	2	1185	0.881	Dose w Arithmetic Avg.

Dose to Driver/Worker from Transport and Off-site Disposal to 1 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate@12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	44	2	498	0.767	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					
	0.00000760	48246	44	2	498	16.069	Hanford
							Dose w Arithmetic Avg.
Dose from Transport to Envirocare Cleanup to 1 mrem/yr	B-25S Dose Rate @ 12Ft (Mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	14	35	2	6026	0.063	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					
	0.00001070	302	35	2	6026	1.363	Envirocare
							Dose w Arithmetic Avg.

Dose to Workers from Disposal of Contaminated Soil: Spreadsheets

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 100 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose BNL Fork Truck Driver Picking B 25 to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00029800	Geometric Avg. (pCi/g) 2303	Pick Time (hours) 0.066	No. of B 25s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.090	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.066	1992	0.001	1.890	Hanford Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00041500	Geometric Avg. (pCi/g) 103	Pick Time (hours) 0.066	No. of B 25s 672	person-rem/mrem 0.001	Collective Dose (person-rem) 0.002	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 2150	0.066	672	0.001	0.040	Envirocare Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00012800	Geometric Avg. (pCi/g) 2303	Transit Time (hours) 0.066	No. of B 25s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.039	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.066	1992	0.001	0.812	Hanford Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00017600	Geometric Avg. (pCi/g) 103	Transit Time (hours) 0.02	No. of B 25s 672	person-rem/mrem 0.001	Collective Dose (person-rem) 0.000	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 2150	0.02	672	0.001	0.005	Envirocare Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s Cleanup to 100 mrem/yr	B-25C Dose Rate @ 12Ft (mrem/hr per pCi/g) 0.00000760	Geometric Avg. (pCi/g) 2303	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 498	Collective Dose (person-rem) 0.001	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.083	1	498	0.015	Hanford Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s Cleanup to 100 mrem/yr	B-25S Dose Rate @ 12Ft (mrem/hr per pCi/g) 0.00001070	Geometric Avg. (pCi/g) 103	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 168	Collective Dose (person-rem) 0.000	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 2150	0.083	1	168	0.000	Envirocare Dose w Arithmetic Avg.
						Total Dose (person-rem)	
						0.130	Hanford Dose w Geometric Avg.
						2.717	Hanford Dose w Arithmetic Avg.
						0.002	Envirocare Dose w Geometric Avg.
						0.045	Envirocare Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 76 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose BNL Fork Truck Driver Picking B 25 to Hanford Cleanup to 76 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00029800	Geometric Avg. (pCi/g) 2303	Pick Time (hours) 0.066	No. of B 25s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.090	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.066	1992	0.001	1.890	Hanford Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare Cleanup to 76 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00041500	Geometric Avg. (pCi/g) 90	Pick Time (hours) 0.066	No. of B 25s 1000	person-rem/mrem 0.001	Collective Dose (person-rem) 0.002	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 1876	0.066	1000	0.001	0.051	Envirocare Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford Cleanup to 76 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00012800	Geometric Avg. (pCi/g) 2303	Transit Time (hours) 0.066	No. of B 25s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.039	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.066	1992	0.001	0.812	Hanford Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare Cleanup to 76 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00017600	Geometric Avg. (pCi/g) 90	Transit Time (hours) 0.02	No. of B 25s 1000	person-rem/mrem 0.001	Collective Dose (person-rem) 0.000	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 1876	0.02	1000	0.001	0.007	Envirocare Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s Cleanup to 76 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00000760	Geometric Avg. (pCi/g) 2303	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 498	Collective Dose (person-rem) 0.001	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246	0.083	1	498	0.015	Hanford Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s Cleanup to 76 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00001070	Geometric Avg. (pCi/g) 90	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 250	Collective Dose (person-rem) 0.000	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 1876	0.083	1	250	0.000	Envirocare Dose w Arithmetic Avg.
						Total Dose (person-rem)	
						0.130	Hanford Dose w Geometric Avg.
						2.717	Hanford Dose w Arithmetic Avg.
						0.003	Envirocare Dose w Geometric Avg.
						0.058	Envirocare Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 25 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose BNL Fork Truck Driver Picking B 25 to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00041500	47	0.066	4740	0.001	0.006	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00041500	993	0.066	4740	0.001	0.129	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00017600	47	0.02	4740	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00017600	993	0.02	4740	0.001	0.017	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s Cleanup to 25 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s Cleanup to 25 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	47	0.083	1	1185	0.000	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00001070	993	0.083	1	1185	0.001	Dose w Arithmetic Avg.
						Total Dose (person-rem)	
						0.130	Hanford Dose w Geometric Avg.
						2.717	Hanford Dose w Arithmetic Avg.
						0.007	Envirocare Dose w Geometric Avg.
						0.147	Envirocare Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 16 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose BNL Fork Truck Driver Picking B 26 to Hanford Cleanup to 16 mrem/yr	B-26C Dose Rate@ 6 Ft (mrem/hr per pCi/g) 0.00029800	Geometric Avg. (pCi/g) 2303	Pick Time (hours) 0.066	No. of B 26s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.090	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246					Hanford Dose w Arithmetic Avg.
	0.00029800		0.066	1992	0.001	1.890	
Dose BNL Fork Truck Driver Picking B 26 to Envirocare Cleanup to 16 mrem/yr	B-26S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00041500	Geometric Avg. (pCi/g) 38	Pick Time (hours) 0.066	No. of B 26s 6592	person-rem/mrem 0.001	Collective Dose (person-rem) 0.007	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 779					Envirocare Dose w Arithmetic Avg.
	0.00041500		0.066	6592	0.001	0.141	
Dose BNL Fork Truck Driver Transit B 26 to Hanford Cleanup to 16 mrem/yr	B-26C Dose Rate@ 6 Ft (mrem/hr per pCi/g) 0.00012800	Geometric Avg. (pCi/g) 2303	Transit Time (hours) 0.066	No. of B 26s 1992	person-rem/mrem 0.001	Collective Dose (person-rem) 0.039	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246					Hanford Dose w Arithmetic Avg.
	0.00012800		0.066	1992	0.001	0.812	
Dose BNL Fork Truck Driver Transit B 26 to Envirocare Cleanup to 16 mrem/yr	B-26S Dose Rate @ 6 Ft (mrem/hr per pCi/g) 0.00017600	Geometric Avg. (pCi/g) 38	Transit Time (hours) 0.02	No. of B 26s 6592	person-rem/mrem 0.001	Collective Dose (person-rem) 0.001	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 779					Envirocare Dose w Arithmetic Avg.
	0.00017600		0.02	6592	0.001	0.018	
Dose to BNL Truck Driver : Hanford B 26s Cleanup to 16 mrem/yr	B-26C Dose Rate@12Ft (mrem/hr per pCi/g) 0.00000760	Geometric Avg. (pCi/g) 2303	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 498	Collective Dose (person-rem) 0.001	Hanford Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48246					Hanford Dose w Arithmetic Avg.
	0.00000760		0.083	1	498	0.015	
Dose to BNL Truck Driver : Envirocare B 26s Cleanup to 16 mrem/yr	B-26S Dose Rate @ 12Ft (mrem/hr per pCi/g) 0.00001070	Geometric Avg. (pCi/g) 38	Trip Time (hours) 0.083	No. of Drivers 1	No. Truck Trips 1648	Collective Dose (person-rem) 0.000	Envirocare Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 779					Envirocare Dose w Arithmetic Avg.
	0.00001070		0.083	1	1648	0.001	
						Total Dose (person-rem)	
						0.130	Hanford Dose w Geometric Avg.
							Hanford Dose w Arithmetic Avg.
						2.717	
							Envirocare Dose w Geometric Avg.
						0.008	
							Envirocare Dose w Arithmetic Avg.
						0.160	

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 1 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose BNL Fork Truck Driver Picking B 25 to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford Dose w Geometric Avg.
	0.00029800	2303	0.066	1992	0.001	0.090	
		Arithmetic Avg. (pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare Cleanup to 1 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00041500	14	0.066	24104	0.001	0.009	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00041500	302	0.066	24104	0.001	0.199	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare Cleanup to 1 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00017600	14	0.02	24104	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00017600	302	0.02	24104	0.001	0.026	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s Cleanup to 1 mrem/yr	B-25C Dose Rate @ 12Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s Cleanup to 1 mrem/yr	B-25S Dose Rate @ 12Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Trip Time (hours)	No. of Drivers	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001070	14	0.083	1	6026	0.000	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00001070	302	0.083	1	6026	0.002	Dose w Arithmetic Avg.
							Total Dose (person-rem)
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.011	Dose w Geometric Avg.
							Envirocare
						0.227	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 76 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.vwb3
Dose Off-site Fork Truck Driver Picking B 26 to Hanford Cleanup to 76 mrem/yr	B-26C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 26s	person-rem/mrem	Collective Dose (person-rem)	Hanford Dose w Geometric Avg.
	0.00029800	2303	0.066	1992	0.001	0.090	
		Arithmetic Avg. (pCi/g)					Hanford Dose w Arithmetic Avg.
	0.00029800	48246	0.066	1992	0.001	1.890	
Dose Off-site Fork Truck Driver Picking B 26 to Envirocare Cleanup to 76 mrem/yr	B-26S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 26s	person-rem/mrem	Collective Dose (person-rem)	Envirocare Dose w Geometric Avg.
	0.00041500	90	0.066	1000	0.001	0.002	
		Arithmetic Avg. (pCi/g)					Envirocare Dose w Arithmetic Avg.
	0.00041500	1876	0.066	1000	0.001	0.051	
Dose Off-site Fork Truck Driver Transit B 26 to Hanford Cleanup to 76 mrem/yr	B-26C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 26s	person-rem/mrem	Collective Dose (person-rem)	Hanford Dose w Geometric Avg.
	0.00012800	2303	0.009	1992	0.001	0.005	
		Arithmetic Avg. (pCi/g)					Hanford Dose w Arithmetic Avg.
	0.00012800	48246	0.009	1992	0.001	0.111	
Dose Off-site Fork Truck Driver Transit B 26 to Envirocare Cleanup to 76 mrem/yr	B-26S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 26s	person-rem/mrem	Collective Dose (person-rem)	Envirocare Dose w Geometric Avg.
	0.00017600	90	0.009	1000	0.001	0.000	
		Arithmetic Avg. (pCi/g)					Envirocare Dose w Arithmetic Avg.
	0.00017600	1876	0.009	1000	0.001	0.003	
						Total Dose (person-rem)	
						0.096	Hanford Dose w Geometric Avg.
						2.001	Hanford Dose w Arithmetic Avg.
						0.003	Envirocare Dose w Geometric Avg.
						0.054	Envirocare Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 16 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose Off-site Fork Truck Driver Picking B 25 to Hanford Cleanup to 16 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford Dose w Geometric Avg.
	0.00029800	2303	0.066	1992	0.001	0.090	
		Arithmetic Avg. (pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocare Cleanup to 16 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare Dose w Geometric Avg.
	0.00041500	38	0.066	6592	0.001	0.007	
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00041500	779	0.066	6592	0.001	0.141	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford Cleanup to 16 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford Dose w Geometric Avg.
	0.00012800	2303	0.009	1992	0.001	0.005	
		Arithmetic Avg. (pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare Cleanup to 16 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare Dose w Geometric Avg.
	0.00017600	38	0.009	6592	0.001	0.008	
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00017600	779	0.009	6592	0.001	0.008	Dose w Arithmetic Avg.
						Total Dose (person-rem)	
						0.096	Hanford Dose w Geometric Avg.
						2.001	Hanford Dose w Arithmetic Avg.
						0.007	Envirocare Dose w Geometric Avg.
						0.149	Envirocare Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 1 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations							File: WRKDISP.wb3
Dose Off-site Fork Truck Driver Picking B 25 to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocare Cleanup to 1 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Pick Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00041500	14	0.066	24104	0.001	0.009	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00041500	302	0.066	24104	0.001	0.199	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Hanford
	0.00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare Cleanup to 1 mrem/yr	B-25S Dose Rate @ 6 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Transit Time (hours)	No. of B 25s	person-rem/mrem	Collective Dose (person-rem)	Envirocare
	0.00017600	14	0.009	24104	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)					Envirocare
	0.00017600	302	0.009	24104	0.001	0.012	Dose w Arithmetic Avg.
							Total Dose (person-rem)
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.010	Dose w Geometric Avg.
							Envirocare
						0.211	Dose w Arithmetic Avg.

Appendix F

Dose to the Future Visitors to the Open Space Before and After Environmental Remediation: RESRAD Printouts and Spreadsheets

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Visitors Dose:
Before and After
Remediation:
RESRAD Printouts
for
0 - 1 foot
and
1 - 12 feet Depth Intervals

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(2)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(2,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(2,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod, 0-1f

file : HWMFOSA.DAT

Site-Specific Parameter Summary

Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
Area of contaminated zone (m**2)	1.932E+04	1.000E+04	---	AREA
Thickness of contaminated zone (m)	3.048E-01	2.000E+00	---	THICKO
Length parallel to aquifer flow (m)	1.615E+02	1.000E+02	---	LCZPAQ
Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
Times for calculations (yr)	6.500E+01	1.000E+00	---	T(2)
Times for calculations (yr)	9.500E+01	3.000E+00	---	T(3)
Times for calculations (yr)	1.250E+02	1.000E+01	---	T(4)
Times for calculations (yr)	1.550E+02	3.000E+01	---	T(5)
Times for calculations (yr)	1.850E+02	1.000E+02	---	T(6)
Times for calculations (yr)	2.150E+02	3.000E+02	---	T(7)
Times for calculations (yr)	2.450E+02	1.000E+03	---	T(8)
Times for calculations (yr)	2.750E+02	0.000E+00	---	T(9)
Times for calculations (yr)	3.050E+02	0.000E+00	---	T(10)
Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(2)
Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(2)
Cover depth (m)	0.000E+00	0.000E+00	---	COVERO
Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
Contaminated zone effective porosity	2.400E-01	2.000E-01	---	BPCZ
Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
Irrigation mode	overhead	overhead	---	IDITCH
Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
Saturated zone effective porosity	2.400E-01	2.000E-01	---	BPSZ
Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
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)	3.353E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-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)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.011E-02	ALREACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.284E-01	ALREACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.500E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	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)	1.400E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod, 0-1f

File : HWMFOSA.DAT

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
018	Meat and poultry consumption (kg/yr)	5.110E+01	6.300E+01	---	DIET(4)
018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
018	Soil ingestion rate (g/yr)	1.800E+01	3.650E+01	---	SOIL
018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
018	Contamination fraction of livestock water	0.000E+00	1.000E+00	---	FLW
018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
018	Contamination fraction of plant food	3.000E-04	-1	---	FPLANT
018	Contamination fraction of meat	2.000E-02	-1	---	FMEAT
018	Contamination fraction of milk	not used	-1	---	FMILK
019	Livestock fodder intake for meat (kg/day)	1.360E+00	6.800E+01	---	LFI5
019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
019	Irrigation fraction from ground water	0.000E+00	1.000E+00	---	FGWIR
14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WIR
14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSIN

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod, 0-1f

File : HWMFOSA.DAT

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	---	REVSX
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVPG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVPG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	0.000E+00	4.500E+01	---	STOR_T(9)
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	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	not used	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	---	PAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

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	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod, 0-1f

File : HWMFOSA.DAT

Contaminated Zone Dimensions	Initial Soil Concentrations, pCi/g
Area: 19315.00 square meters	Cs-137 1.000E+00
Thickness: 0.30 meters	Sr-90 1.000E+00
Cover Depth: 0.00 meters	

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 15 mrem/yr

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

t (years):	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
TDOSE(t):	5.611E-03	1.447E-04	2.898E-05	5.760E-06	1.129E-06	2.154E-07	3.934E-08	6.571E-09	8.663E-10	0.000E+00
M(t):	3.740E-04	9.643E-06	1.932E-06	3.840E-07	7.525E-08	1.436E-08	2.623E-09	4.381E-10	5.775E-11	0.000E+00

Maximum TDOSE(t): 5.611E-03 mrem/yr at t = 0.000E+00 years

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

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr										
			t=	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	4.641E-03	<u>1.447E-04</u>	<u>2.898E-05</u>	<u>5.760E-06</u>	<u>1.129E-06</u>	<u>2.154E-07</u>	<u>3.934E-08</u>	<u>6.571E-09</u>	<u>8.663E-10</u>	0.000E+00	←
Sr-90	Sr-90	1.000E+00	9.691E-04	1.326E-16	1.502E-22	1.670E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	←

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g										
			t = 0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02	
Cs-137	Cs-137	1.000E+00	1.000E+00	3.147E-02	6.377E-03	1.292E-03	2.618E-04	5.306E-05	1.075E-05	2.179E-06	4.415E-07	8.946E-08	
Sr-90	Sr-90	1.000E+00	1.000E+00	1.716E-13	2.201E-19	2.823E-25	3.622E-31	4.646E-37	5.956E-43	0.000E+00	0.000E+00	0.000E+00	

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

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Dose Conversion Factor (and Related) Parameter Summary

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B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(2)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(2,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(2,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

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)	6.798E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.352E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.400E+01	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	6.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	9.500E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.250E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.550E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.850E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	2.150E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	2.450E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	2.750E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	3.050E+02	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	3.048E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.660E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	BPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	BPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	BPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+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)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(1)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.738E-03	ALBACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(2)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.896E-02	ALBACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.500E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	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)	1.400E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
018	Meat and poultry consumption (kg/yr)	5.110E+01	6.300E+01	---	DIET(4)
018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
018	Soil ingestion rate (g/yr)	1.800E+01	3.650E+01	---	SOIL
018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
018	Contamination fraction of livestock water	0.000E+00	1.000E+00	---	FLW
018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
018	Contamination fraction of plant food	3.000E-04	-1	---	FPLANT
018	Contamination fraction of meat	2.000E-02	-1	---	FMEAT
018	Contamination fraction of milk	not used	-1	---	FMILK
019	Livestock fodder intake for meat (kg/day)	1.360E+00	6.800E+01	---	LFI5
019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
019	Irrigation fraction from ground water	0.000E+00	1.000E+00	---	FGWIR
014	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	CL2WTR
014	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	CL2CZ
014	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
014	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
014	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
014	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSIN
014	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
014	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
014	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
TOR	Storage times of contaminated foodstuffs (days):				
TOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
TOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
TOR	Milk	not used	1.000E+00	---	STOR_T(3)
TOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
TOR	Fish	not used	7.000E+00	---	STOR_T(5)
TOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
TOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
TOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
TOR	Livestock fodder	0.000E+00	4.500E+01	---	STOR_T(9)

Site-Specific Parameter Summary (continued)

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

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	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	6798.00 square meters	Cs-137	1.000E+00
Thickness:	3.35 meters	Sr-90	1.000E+00
cover Depth:	0.30 meters		

Total Dose TDOSE(t), mrem/yr										
Basic Radiation Dose Limit = 15 mrem/yr										
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)										
t (years):	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
TDOSE(t):	1.948E-03	7.697E-05	3.106E-05	1.680E-05	1.046E-05	6.971E-06	4.806E-06	3.386E-06	2.423E-06	1.745E-06
M(t):	1.298E-04	5.132E-06	2.071E-06	1.120E-06	6.971E-07	4.648E-07	3.204E-07	2.257E-07	1.615E-07	1.163E-07

Maximum TDOSE(t): 1.948E-03 mrem/yr at t = 0.000E+00 years

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod,1-12f

File : HWMFOSB.DAT

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

Nuclide Parent		BRF(i)	DOSE(j,t), mrem/yr										
(j)	(i)		t=	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	1.547E-04	<u>4.332E-05</u>	<u>2.571E-05</u>	<u>1.595E-05</u>	<u>1.032E-05</u>	<u>6.950E-06</u>	<u>4.802E-06</u>	<u>3.386E-06</u>	<u>2.423E-06</u>	<u>1.745E-06</u>	←
Sr-90	Sr-90	1.000E+00	1.793E-03	<u>3.365E-05</u>	<u>5.354E-06</u>	<u>8.502E-07</u>	<u>1.348E-07</u>	<u>2.137E-08</u>	<u>3.385E-09</u>	<u>5.357E-10</u>	<u>8.476E-11</u>	<u>1.343E-11</u>	←

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide Parent		BRF(i)	S(j,t), pCi/g										
(j)	(i)		t=	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	1.000E+00	1.864E-01	8.586E-02	3.955E-02	1.821E-02	8.389E-03	3.864E-03	1.780E-03	8.196E-04	3.775E-04	
Sr-90	Sr-90	1.000E+00	1.000E+00	1.692E-02	2.575E-03	3.918E-04	5.961E-05	9.071E-06	1.380E-06	2.101E-07	3.196E-08	4.864E-09	

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

Dose to the Future Visitors to the Open Space
Before and After
Environmental Remediation:
Spreadsheets

Volume Weighted Arithmetic & Geometric Concentration vs. Depth Interval

Visitors Dose: Radionuclide Concentrations before Remediation for 0-1 foot and 1-12 feet
Depth Intervals

Volume Weighted Averages	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	TOTAL VOLUME	
Volume vs. Depth Interval *	(CY)	(CY)	(CY)	(CY)	(CY)	
Depth Interval Total Volume	7600	8110	9830	5260	30800	
	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)		
Cs 137 Geometric Average Conc.	608.48	164.43	1003.81	614.97		
Sr 90 Geometric Average Conc.	14.31	2.50	6.25	2.99		
Cs 137 Arithmetic Average Conc.	50721	510	5553	1678		
Sr 90 Arithmetic Average Conc.	112.5	6.95	27.93	13.92		
Weighted Geometric Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	150	43	320	105	619	Geometric Average
Strontium 90	3.53	0.66	2.00	0.51	6.69	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0235	0.0152	0.0062	0.0049		0.0108
Weighted Arithmetic Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	12518	134	1772	287	14709	Arithmetic Average
Strontium 90	27.76	1.83	8.92	2.38	40.89	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0022	0.0136	0.0050	0.0083		0.0028
No action Alternative						
Cs 137 Arithmetic Avg. 0 -1 ft	50721					
Cs 137 Vol W Arithmetic Avg. 1 -12 ft	2912					
Cs 137 Geometric Avg. 0 -1 ft	608					
Cs 137 Vol W Geometric Avg. 1 -12 ft	622					

Projected Dose to Visitors to HWMF: No Action

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	VISITORDOSE wb3	
Average Individual Dose Projections 2048 to 2318	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.86E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.18E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose Calculation Year	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2048 - 2318	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean Cs 137 Concentration	608	608	608	608	608	608	608	608	608		
1-12 ft.Vol. Weighted Geometric Mean Cs 137 Concentration	622	622	622	622	622	622	622	622	622		
Collective Dose to 30 Visitors for 30 Yr Period	1.03E-01	3.03E-02	1.20E-02	6.39E-03	4.01E-03	2.71E-03	1.90E-03	1.36E-03	9.77E-04	0.1831	No Action
30 yr Period	2048 to 2078	2078 to 2108	2108 to 2138	2138 to 2168	2168 to 2198	2198 to 2228	2228 to 2258	2258 to 2288	2288 to 2318	2048 to 2318	
Average Individual Annual Dose	1.15E-04	3.36E-05	1.34E-05	7.11E-06	4.45E-06	3.01E-06	2.11E-06	1.51E-06	1.09E-06		
Future Visitor Collective Dose: 2048 - 2318	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean Cs 137 Concentration	50720	50720	50720	50720	50720	50720	50720	50720	50720		
1-12 ft.Vol. Weighted Arithmetic Mean Cs 137 Concentration	2912	2912	2912	2912	2912	2912	2912	2912	2912		
Collective Dose to 30 Visitors for 30 Yr Period	8.72E+00	1.39E+00	3.01E-01	7.86E-02	2.80E-02	1.44E-02	9.17E-03	6.39E-03	4.57E-03	8.5509	No Action
30 yr Period	2048 to 2078	2078 to 2108	2108 to 2138	2138 to 2168	2168 to 2198	2198 to 2228	2228 to 2258	2258 to 2288	2288 to 2318	2048 to 2318	
Average Individual Annual Dose	7.47E-03	1.54E-03	3.34E-04	8.73E-05	3.12E-05	1.60E-05	1.02E-05	7.10E-06	5.08E-06		

Visitors Dose: Radionuclide Concentrations after Remediation to Various Remediation Goals

Differential Volumes vs. Cs 137 Derived Concentration Guideline Limit Interval							
	Strontium 90	Cesium 137	Concentration	Concentration	Cummulative Volume	Cummulative Volume	Total Cesium-137
Soil Cleanup Limit/Goals (mrem/yr)	DCGL (pCi/g)	DCGL (pCi/g)	@ DCGL Upper Limit (pCi/g)	@ DCGL Lower Limit (pCi/g)	@ DCGL Upper Limit *	@ DCGL Lower Limit	Differential Volume (CY)
100	38556	1513	810000	1513	188	8000	7812
75	28920	1135	1513	1135	8000	8990	990
25	9836	378	1135	378	8990	20200	11210
15	5784	227	378	227	20200	25750	5550
1	386	15	227	15	25750	78292	52542
* Volume for Cs 137 > 810000pCi/g	= 352792(Conc.)-0.554	Volume for Cs 137 15 pCi/g	= 352792(Conc.)-0.554			TOTAL VOLUME >	78103

Projected Dose to Visitors to HWMF: 100 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.vb3
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.164E-07	3.93E-08	6.571E-09	8.68E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423868E-06	1.745E-06		
Dose Calculation Year	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	456.47	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	456.47	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721		
Collective Dose to 30 Visitors for 30 Yr Period	7.72E-02	2.25E-02	8.88E-03	4.70E-03	2.94E-03	1.99E-03	1.39E-03	9.96E-04	7.17E-04	0.1214	@ 100 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	8.58E-05	2.50E-05	9.87E-06	5.23E-06	3.27E-06	2.21E-06	1.55E-06	1.11E-06	7.97E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean:Cs 137 Concentration	1513	1513	1513	1513	1513	1513	1513	1513	1513		
1-12 ft.Vol. Weighted Arithmetic Mean:Cs 137Concentration	1513	1513	1513	1513	1513	1513	1513	1513	1513		
Collective Dose to 30 Visitors for 30 Yr Period	2.56E-01	7.45E-02	2.94E-02	1.56E-02	9.78E-03	6.59E-03	4.62E-03	3.30E-03	2.38E-03	0.4022	@ 100 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.84E-04	8.28E-05	3.27E-05	1.73E-05	1.08E-05	7.32E-06	5.13E-06	3.67E-06	2.64E-06		

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Projected Dose to Visitors to HWMF: 75 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.366E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423666E-06	1.745E-06		
Dose Calculation Year	2081	2081	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	342	342	342	342	342	342	342	342	342		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137 Concentration	342	342	342	342	342	342	342	342	342		
Collective Dose to 30 Visitors for 30 Yr Period	5.79E-02	1.69E-02	6.66E-03	3.53E-03	2.21E-03	1.49E-03	1.05E-03	7.47E-04	5.38E-04	0.0910	@ 75 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	6.44E-05	1.87E-05	7.40E-06	3.92E-06	2.45E-06	1.66E-06	1.16E-06	8.30E-07	5.98E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean:Cs 137 Concentration	1135	1135	1135	1135	1135	1135	1135	1135	1135		
1-12 ft.Vol. Weighted Arithmetic Mean:Cs 137 Concentration	1135	1135	1135	1135	1135	1135	1135	1135	1135		
Collective Dose to 30 Visitors for 30 Yr Period	1.92E-01	5.59E-02	2.21E-02	1.17E-02	7.32E-03	4.95E-03	3.47E-03	2.48E-03	1.78E-03	0.3017	@ 75 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.13E-04	6.21E-05	2.45E-05	1.30E-05	8.13E-06	5.49E-06	3.85E-06	2.75E-06	1.98E-06		

Projected Dose to Visitors to HWMF: 25 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.80E-05	5.67E-06	1.13E-06	2.15E-07	3.93E-08	6.571E-09	6.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.388E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose Calculation Year	2091	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	114	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	114	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428	114.0428		
Collective Dose to 30 Visitors for 30 Yr Period	1.03E-02	5.82E-03	2.22E-03	1.18E-03	7.35E-04	4.07E-04	3.48E-04	2.49E-04	1.79E-04	0.0303	@ 25 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.14E-05	6.24E-06	2.47E-06	1.31E-06	8.17E-07	5.52E-07	3.87E-07	2.76E-07	1.99E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean:Cs 137 Concentration	378	378	378	378	378	378	378	378	378		
1-12 ft.Vol. Weighted Arithmetic Mean:Cs 137Concentration	378	378	378	378	378	378	378	378	378		
Collective Dose to 30 Visitors for 30 Yr Period	6.40E-02	1.80E-02	7.36E-03	3.89E-03	2.44E-03	1.85E-03	1.15E-03	8.25E-04	5.94E-04	0.1005	@ 25 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	7.11E-05	2.07E-05	8.17E-06	4.33E-06	2.71E-06	1.83E-06	1.28E-06	8.16E-07	6.60E-07		

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Projected Dose to Visitors to HWMF: 15 mrem

	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.87E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.68E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.388E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423888E-06	1.745E-06		
Dose Calculation Year	2081	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean: Cs 137 Concentration	68	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859		
1-12 ft. Vol. Weighted Geometric Mean: Cs 137 Concentration	68	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859		
Collective Dose to 30 Visitors for 30 Yr Period	1.16E-02	3.37E-03	1.33E-03	7.08E-04	4.42E-04	2.98E-04	2.09E-04	1.49E-04	1.08E-04	0.0182	@15 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	1.29E-05	3.75E-06	1.48E-06	7.84E-07	4.91E-07	3.32E-07	2.32E-07	1.68E-07	1.20E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean: Cs 137 Concentration	227	227	227	227	227	227	227	227	227		
1-12 ft. Vol. Weighted Arithmetic Mean: Cs 137 Concentration	227	227	227	227	227	227	227	227	227		
Collective Dose to 30 Visitors for 30 Yr Period	3.84E-02	1.12E-02	4.42E-03	2.34E-03	1.48E-03	9.89E-04	6.93E-04	4.95E-04	3.57E-04	0.0803	@15 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	4.27E-05	1.24E-05	4.91E-06	2.60E-06	1.63E-06	1.10E-06	7.70E-07	5.50E-07	3.98E-07		

Projected Dose to Visitors to HWMF: 1 mrem

	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	Dose: Conc.	File: VISITORDOSE.wb3
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.80E-05	5.87E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423886E-06	1.745E-06		
Dose Calculation Year	2081	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean: Cs 137 Concentration	5	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587		
1-12 ft. Vol. Weighted Geometric Mean: Cs 137 Concentration	5	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587	4.55587		
Collective Dose to 30 Visitors for 30 Yr Period	7.71E-04	2.24E-04	8.86E-05	4.89E-05	2.84E-05	1.68E-05	1.39E-05	9.94E-06	7.15E-06	0.0012	@ 1 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	8.57E-07	2.49E-07	9.85E-08	5.22E-08	3.26E-08	2.21E-08	1.55E-08	1.10E-08	7.95E-09		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmetic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmetic Mean: Cs 137 Concentration	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1		
1-12 ft. Vol. Weighted Arithmetic Mean: Cs 137 Concentration	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1		
Collective Dose to 30 Visitors for 30 Yr Period	2.58E-03	7.44E-04	2.94E-04	1.58E-04	9.74E-05	6.58E-05	4.61E-05	3.29E-05	2.37E-05	0.0040	@ 1 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.84E-08	8.28E-07	3.28E-07	1.73E-07	1.08E-07	7.31E-08	5.12E-08	3.68E-08			

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Appendix G

Dose to the Public from Environmental Remediation: CAP88 Printouts and Spreadsheets

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Dose to the Public from Environmental Remediation: 100 mrem/yr Limit.	G-1
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Dose to Future Public: Savings, Impacts and Avoided	G-53

Dose to the Public from Environmental
Remediation: 100 mrem/yr Limit

Fugitive Dust Release Rates:100 mre/yr

Fugitive Dust		Arithmetic Avg		Arithmetic Avg
Arithmetic Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pci/ci)	(pci/g)	(g/yr)	(ci/yr)
Strontium-90	1.00E-12	136	152	2.07E-08
Cesium-137	1.00E-12	48628	152	7.39E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pci/ci)	(pci/g)	(g/yr)	(ci/yr)
Strontium-90	1.00E-12	87	152	1.32E-08
Cesium-137	1.00E-12	8036	152	1.22E-06

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment

Mar 11, 1997 01:04 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 100 mrem/yr (A)

Effective Dose Equivalent
(mrem/year)

2.00E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 100A
Dataset Date: Mar 11, 1997 01:04 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.82E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.34E-05	5.23E-04
BREAST	2.15E-05	4.85E-04
R MAR	1.81E-05	4.12E-04
LUNGS	1.78E-05	4.06E-04
THYROID	2.22E-05	5.03E-04
ENDOST	1.98E-05	4.42E-04
RMNDR	1.80E-05	4.13E-04
EFPEC	2.00E-05	<u>4.54E-04</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.55E-07	1.55E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	7.4E-06	7.4E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.1E-08	2.1E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature: 10 degrees C
 Precipitation: 123 cm/y
 Mixing Height: 2000 m

SOURCE INFORMATION

Source Number: 1

Source Height (m): 1.

Area (sq m): 19565.

Plume Rise							
Pasquill Cat:	A	B	C	D	E	F	G
Zero:	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Beef Cattle Density:	5.83E-02
Milk Cattle Density:	8.56E-02
Land Fraction Cultivated for Vegetable Crops:	1.88E-02

POPULATION DATA

Direction	Distance (m)						
	750	1550	1650	8850	24000	40000	56000
N	0	1	0	4600	0	0	250750
NNW	0	1	0	7760	0	210635	108020
NW	0	1	0	18220	1585	136710	123880
WNW	0	1	0	42290	59260	130	216640
W	0	1	0	50185	135645	240690	226970
WSW	0	1	0	38425	145975	356715	426660
SW	0	1	0	22090	65745	3460	0
SSW	0	1	0	21640	1110	0	0
S	0	1	0	15730	35	0	0
SSE	0	1	0	22685	0	0	0
SE	0	1	0	9175	0	0	0
ESE	0	1	0	6310	7780	0	0
E	0	1	0	3060	16155	17575	9155
ENE	0	1	0	2510	7000	13035	15060
NE	0	1	0	2980	755	0	13680
NNE	0	1	0	7660	0	0	44770

Distance (m)

Direction	72000
-----------	-------

N	260880
NNW	54595
NW	111300
WNW	130400
W	372315
WSW	777545
SW	0
SSW	0
S	0
SSE	0
SE	0
ESE	0
E	575
ENE	2280
NE	33345
NNE	65965

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 3, 1997 05:10 pmm

Facility: BNLS Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 100 mrem/yr (G)

Effective Dose Equivalent
(mrem/year)

3.31E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 100G
Dataset Date: Feb 3, 1997 05:09 pm
Wind File: C:\CAP88PC2\WINDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 7.96E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.86E-06	8.63E-05
BREAST	3.55E-06	8.02E-05
R MAR	3.01E-06	6.92E-05
LUNGS	2.94E-06	6.70E-05
THYROID	3.67E-06	8.31E-05
ENDOST	3.34E-06	7.55E-05
RMNDR	2.97E-06	6.82E-05
EFPEC	3.31E-06	<u>7.51E-05</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.57E-08	2.57E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	1.2E-06	<u>1.2E-06</u>
BA-137M	D	1.00	0.0E+00	<u>0.0E+00</u>
SR-90	D	1.00	1.3E-08	<u>1.3E-08</u>
Y-90	Y	1.00	0.0E+00	<u>0.0E+00</u>

SITE INFORMATION

Temperature:	10 degrees C
Precipitation:	123 cm/y
Mixing Height:	2000 m

Dose to the Public from Environmental
Remediation: 75 mrem/yr Goal

Fugitive Dust Release Rates: 75 mrem/yr

Fugitive Dust				
Arithmetic Avg Release		Arithmetic Avg		Arithmetic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	122	174	2.13E-08
Cesium-137	1.00E-12	43418	174	7.57E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	71	174	1.24E-08
Cesium-137	1.00E-12	6585	174	1.15E-06

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment

Feb 3, 1997 05:01 pmm

Facility: BNLS Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 75 mrem/yr (A)

Effective Dose Equivalent
(mrem/year)

2.01E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 75
Dataset Date: Feb 3, 1997 05:01 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.84E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.35E-05	5.25E-04
BREAST	2.16E-05	4.87E-04
R MAR	1.82E-05	4.14E-04
LUNGS	1.79E-05	4.07E-04
THYROID	2.23E-05	5.05E-04
ENDOST	1.99E-05	4.44E-04
RMNDR	1.81E-05	4.15E-04
EFFEC	2.01E-05	<u>4.56E-04</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.56E-07	1.56E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	7.4E-06	7.4E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.4E-08	2.4E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature: 10 degrees C
 Precipitation: 123 cm/y
 Mixing Height: 2000 m

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Mar 11, 1997 01:10 pm

Facility: BNLS Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 75 mrem/yr (G)

Effective Dose Equivalent
(mrem/year)

3.07E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 75G
Dataset Date: Mar 11, 1997 01:10 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILS\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 7.38E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.57E-06	7.99E-05
BREAST	3.29E-06	7.42E-05
R MAR	2.79E-06	6.41E-05
LUNGS	2.73E-06	6.20E-05
THYROID	3.40E-06	7.70E-05
ENDOST	3.09E-06	6.99E-05
RMNDR	2.75E-06	6.32E-05
EFFEC	3.07E-06	<u>6.96E-05</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.38E-08	2.38E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	1.1E-06	<u>1.1E-06</u>
BA-137M	D	1.00	0.0E+00	<u>0.0E+00</u>
SR-90	D	1.00	1.2E-08	<u>1.2E-08</u>
Y-90	Y	1.00	0.0E+00	<u>0.0E+00</u>

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 123 cm/y
Mixing Height: 2000 m

Dose to the Public from Environmental
Remediation: 25 mrem/yr Goal

Fugitive Dust Release Rates: 25 mrem/yr

Fugitive Dust		Arithmetic Avg			
Arithmetic Avg Release		Arithmetic Avg	E 10	Q	
Radionuclide	Conv. Factor	RSC	(g/yr)	(Ci/yr)	
Strontium-90	1.00E-12	55	374	2.05E-08	
Cesium-137	1.00E-12	19743	374	7.37E-06	
Fugitive Dust		Geometric Avg	E 10	Q	
Geometric Avg Release	Conv. Factor	RSC	(g/yr)	(Ci/yr)	
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)	
Strontium-90	1.00E-12	21	374	7.84E-09	
Cesium-137	1.00E-12	1981	374	7.40E-07	

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 4, 1997 12:27 pmm

Facility: BNLS Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 25 mrem/yr (A)

Effective Dose Equivalent
(mrem/year)

2.06E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 25A
Dataset Date: Feb 4, 1997 12:26 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.96E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.40E-05	5.37E-04
BREAST	2.21E-05	4.99E-04
R MAR	1.86E-05	4.24E-04
LUNGS	1.83E-05	4.17E-04
THYROID	2.29E-05	5.18E-04
ENDOST	2.04E-05	4.55E-04
RMNDR	1.85E-05	4.25E-04
EFFEC	2.06E-05	<u>4.67E-04</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-07	1.60E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	7.6E-06	<u>7.6E-06</u>
BA-137M	D	1.00	0.0E+00	<u>0.0E+00</u>
SR-90	D	1.00	2.4E-08	<u>2.4E-08</u>
Y-90	Y	1.00	0.0E+00	<u>0.0E+00</u>

SITE INFORMATION

Temperature:	10 degrees C
Precipitation:	123 cm/y
Mixing Height:	2000 m

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment

Mar 11, 1997 01:20 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 25 mrem/yr (G)

Effective Dose Equivalent
(mrem/year)

2.07E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 25G
Dataset Date: Mar 11, 1997 01:20 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.98E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.41E-06	5.40E-05
BREAST	2.22E-06	5.01E-05
R MAR	1.88E-06	4.32E-05
LUNGS	1.84E-06	4.19E-05
THYROID	2.30E-06	5.20E-05
ENDOST	2.09E-06	4.72E-05
RMNDR	1.86E-06	4.26E-05
EFFEC	2.07E-06	<u>4.70E-05</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-08	1.60E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	7.6E-07	<u>7.6E-07</u>
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	8.1E-09	<u>8.1E-09</u>
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 123 cm/y
Mixing Height: 2000 m

Dose to the Public from Environmental
Remediation: 15 mrem/yr Goal

Fugitive Dust Release Rates: 15 mrem/yr

Fugitive Dust					
Arithmetic Avg Release		Arithmetic Avg		Arithmetic Avg	
Radionuclide	Conv. Factor	RSC	E 10	Q	
	(pci/ci)	(pci/g)	(g/yr)	(ci/yr)	
Strontium-90	1.00E-12	44	498	2.19E-08	
Cesium-137	1.00E-12	15553	498	7.75E-06	
Fugitive Dust		Geometric Avg		Geometric Avg	
Geometric Avg Release	Conv. Factor	RSC	E 10	Q	
	(pci/ci)	(pci/g)	(g/yr)	(ci/yr)	
Radionuclide					
Strontium-90	1.00E-12	14	498	6.97E-09	
Cesium-137	1.00E-12	1321	498	6.58E-07	

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 4, 1997 12:38 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 15 mrem/yr(A)

Effective Dose Equivalent
(mrem/year)

2.07E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 15A
Dataset Date: Feb 4, 1997 12:37 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.97E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.41E-05	5.39E-04
BREAST	2.22E-05	5.01E-04
R MAR	1.87E-05	4.25E-04
LUNGS	1.84E-05	4.18E-04
THYROID	2.29E-05	5.19E-04
ENDOST	2.05E-05	4.56E-04
RMNDR	1.86E-05	4.26E-04
EFFEC	2.07E-05	<u>4.68E-04</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-07	1.60E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	7.6E-06	<u>7.6E-06</u>
BA-137M	D	1.00	0.0E+00	<u>0.0E+00</u>
SR-90	D	1.00	2.5E-08	<u>2.5E-08</u>
Y-90	Y	1.00	0.0E+00	<u>0.0E+00</u>

SITE INFORMATION

Temperature: 10 degrees C
 Precipitation: 123 cm/y
 Mixing Height: 2000 m

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment

Mar 11, 1997 01:28 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 15 mrem/yr(G)

Effective Dose Equivalent
(mrem/year)

1.76E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 15G
Dataset Date: Mar 11, 1997 01:27 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILS\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 4.22E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.05E-06	4.58E-05
BREAST	1.88E-06	4.25E-05
R MAR	1.60E-06	3.67E-05
LUNGS	1.56E-06	3.55E-05
THYROID	1.95E-06	4.41E-05
ENDOST	1.77E-06	4.00E-05
RMNDR	1.58E-06	3.62E-05
EFFEC	1.76E-06	<u>3.98E-05</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.36E-08	1.36E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	6.5E-07	<u>6.5E-07</u>
BA-137M	D	1.00	0.0E+00	<u>0.0E+00</u>
SR-90	D	1.00	6.9E-09	<u>6.9E-09</u>
Y-90	Y	1.00	0.0E+00	<u>0.0E+00</u>

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 123 cm/y
Mixing Height: 2000 m

Dose to the Public from Environmental
Remediation: 1 mrem/yr Goal

G-44

Fugitive Dust Release Rates: 1 mrem/yr

Fugitive Dust				
Arithmetic Avg Release		Arithmetic Avg		Arithmetic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Cl)	(pCi/g)	(g/yr)	(Cl/yr)
Strontium-90	1.00E-12	15	1942	2.91E-08
Cesium-137	1.00E-12	5196	1942	1.01E-05
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Cl)	(pCi/g)	(g/yr)	(Cl/yr)
Strontium-90	1.00E-12	3	1942	5.83E-09
Cesium-137	1.00E-12	266	1942	5.17E-07

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Dec 8, 1997 03:46 pmm

Facility: BNLS Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 1 mrem/yr(A)

Effective Dose Equivalent
(mrem/year)

2.74E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 1A
Dataset Date: Dec 8, 1997 03:46 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 6.59E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.19E-05	7.14E-04
BREAST	2.94E-05	6.63E-04
R MAR	2.47E-05	5.63E-04
LUNGS	2.44E-05	5.54E-04
THYROID	3.04E-05	6.88E-04
ENDOST	2.71E-05	6.04E-04
RMNDR	2.46E-05	5.64E-04
EFPEC	2.74E-05	<u>6.20E-04</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.12E-07	2.12E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	1.0E-05	<u>1.0E-05</u>
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.9E-08	<u>2.9E-08</u>
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 123 cm/y
Mixing Height: 2000 m

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Dec 8, 1997 03:40 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
 Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 1 mrem/yr(G)

Effective Dose Equivalent
(mrem/year)

1.40E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 1'G
Dataset Date: Dec 8, 1997 03:39 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
 Lifetime Fatal Cancer Risk: 3.38E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	1.64E-06	3.66E-05
BREAST	1.50E-06	3.40E-05
R MAR	1.28E-06	2.93E-05
LUNGS	1.25E-06	2.84E-05
THYROID	1.56E-06	3.52E-05
ENDOST	1.42E-06	3.21E-05
RMNDR	1.26E-06	2.89E-05
EFFEC	1.40E-06	<u>3.19E-05</u>

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.09E-08	1.09E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
CS-137	D	1.00	5.2E-07	<u>5.2E-07</u>
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	5.8E-09	<u>5.8E-09</u>
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature: 10 degrees C
Precipitation: 123 cm/y
Mixing Height: 2000 m

**Dose to Future Public:
Savings, Impacts and Avoided**

Savings, Impacts and Avoided Dose to Public

Dose Impacts to Public from Remediation and Public Dose Averted				File: PUBDOSE.wb3
Public Collective Dose Impacts	Remediation Dose	Transport/Disposal Dose	Public Dose Impact	
Geometric Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	
Dose to 1 mrem/yr	0.000032	0.32	0.32	
Dose to 15 mrem/yr	0.000040	0.31	0.31	
Dose to 25mrem/yr	0.000047	0.31	0.31	
Dose to 75 mrem/yr	0.000070	0.30	0.30	
Dose to 100 mrem/yr	0.000075	0.30	0.30	
Public Collective Dose Impacts	Remediation Dose	Transport/Disposal Dose	Public Dose Impact	
Arithmetic Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	
Dose to 1 mrem/yr	0.000620	6.68	6.68	
Dose to 15 mrem/yr	0.000468	6.54	6.54	
Dose to 25mrem/yr	0.000467	6.50	6.50	
Dose to 75 mrem/yr	0.000456	6.31	6.31	
Dose to 100 mrem/yr	0.000454	6.28	6.28	
Public Collective Dose Averted	Public Dose w/o Remed	Public Dose w Remed	Public Dose Impact	Public Dose Averted
Arithmetic Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	(Person-rem)
Dose to 1 mrem/yr	8.55	0.004	6.68	1.87
Dose to 15 mrem/yr	8.55	0.060	6.54	1.95
Dose to 25mrem/yr	8.55	0.100	6.50	1.95
Dose to 75 mrem/yr	8.55	0.302	6.31	1.94
Dose to 100 mrem/yr	8.55	0.402	6.28	1.87

Appendix H

Dose to Public from Transport and Disposal of Contaminated Soil: Microshield Printouts and Spreadsheets

Contents

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Dose to Public from Transport and Disposal
of Contaminated Soil: Microshield Printouts
for B-25s with NBS Concrete & BNL Soil. .H-1

Dose to Public from Transport and Disposal
of Contaminated Soil: SpreadsheetsH-15

Dose to Public from Transport and Disposal of
Contaminated Soil: Microshield Printouts
for B-25s with NBS Concrete & BNL Soil

Page : 1
IOS File : B25CPUB.MS5
Run Date: June 1, 1997
Run Time: 11:55:38 AM
Duration : 00:01:15

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CPUB
Description: B-25 Box w Cs 137@1 pCi/g in NBS Concrete :Public @12ft side
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	3535.68 cm 116 ft	60.96 cm 2 ft	182.88 cm 6 ft
# 2	853.44 cm 28 ft 0.0 in	60.96 cm 2 ft	182.88 cm 6 ft
# 3	2773.68 cm 91 ft	60.96 cm 2 ft	182.88 cm 6 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	384.0 ft ³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (116,2,6) ft

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	2.756e-21	8.786e-21	2.295e-23	7.318e-23
0.0322	2.428e+04	1.351e-20	4.406e-20	1.087e-22	3.546e-22
0.0364	8.835e+03	2.290e-17	9.565e-17	1.301e-19	5.435e-19
0.6616	5.719e+05	2.081e-05	6.754e-05	4.035e-08	1.309e-07
TOTALS:	6.182e+05	2.081e-05	6.754e-05	4.035e-08	1.309e-07

Results - Dose Point # 2 - (28,2,6) ft

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	2.049e-19	6.505e-19	1.707e-21	5.419e-21
0.0322	2.428e+04	1.007e-18	3.271e-18	8.107e-21	2.633e-20
0.0364	8.835e+03	1.782e-15	7.390e-15	1.012e-17	4.199e-17
0.6616	5.719e+05	1.593e-03	4.490e-03	3.088e-06	8.705e-06
TOTALS:	6.182e+05	1.593e-03	4.490e-03	3.088e-06	8.705e-06

Results - Dose Point # 3 - (91,2,6) ft

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	6.362e-21	2.023e-20	5.299e-23	1.685e-22
0.0322	2.428e+04	3.107e-20	1.011e-19	2.501e-22	8.133e-22
0.0364	8.835e+03	5.094e-17	2.118e-16	2.894e-19	1.204e-18
0.6616	5.719e+05	3.963e-05	1.238e-04	7.683e-08	2.400e-07
TOTALS:	6.182e+05	3.963e-05	1.238e-04	7.683e-08	2.400e-07

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CPUB.MS5
Case Title: B25CPUB
This case was run on Sunday, June 1, 1997 at 11:55:38 AM
Dose Point # 1 - (116,2,6) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	3.146e-005	1.021e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	2.081e-005	6.754e-005
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.035e-008	1.309e-007
Absorbed Dose Rate in Air	mGy/hr	3.522e-010	1.143e-009
"	mrads/hr	3.522e-008	1.143e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.170e-010	1.353e-009
o Opposed	"	3.339e-010	1.083e-009
o Rotational	"	3.339e-010	1.083e-009
o Isotropic	"	2.953e-010	9.581e-010
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.433e-010	1.438e-009
o Opposed	"	4.210e-010	1.366e-009
o Rotational	"	4.210e-010	1.366e-009
o Isotropic	"	3.156e-010	1.024e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	3.688e-010	<u>1.197e-009 #1</u>
o Posterior/Anterior	"	3.255e-010	1.056e-009
o Lateral	"	2.414e-010	7.832e-010
o Rotational	"	2.909e-010	9.439e-010
o Isotropic	"	2.476e-010	8.035e-010

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CPUB.MS5
Case Title: B25CPUB
This case was run on Sunday, June 1, 1997 at 11:55:38 AM
Dose Point # 3 - (91,2,6) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	5.990e-005	1.871e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	3.963e-005	1.238e-004
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	7.683e-008	2.400e-007
Absorbed Dose Rate in Air	mGy/hr	6.707e-010	2.096e-009
"	mrad/hr	6.707e-008	2.096e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.941e-010	2.481e-009
o Opposed	"	6.358e-010	1.986e-009
o Rotational	"	6.358e-010	1.986e-009
o Isotropic	"	5.622e-010	1.757e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	8.440e-010	2.637e-009
o Opposed	"	8.016e-010	2.505e-009
o Rotational	"	8.016e-010	2.505e-009
o Isotropic	"	6.010e-010	1.878e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	7.022e-010	2.194e-009
o Posterior/Anterior	"	6.198e-010	1.936e-009
o Lateral	"	4.596e-010	1.436e-009
o Rotational	"	5.539e-010	1.730e-009 #4
o Isotropic	"	4.715e-010	1.473e-009

Page : 1
DOS File : B25CSPUB.MS5
Run Date: June 1, 1997
Run Time: 11:49:27 AM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CSPUB

Description: B-25 Box w Cs 137@1 pCi/g in NBS Concrete :Public @12ft side
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	182.88 cm	6 ft
Width	487.68 cm	16 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	548.64 cm 18 ft	60.96 cm 2 ft	182.88 cm 6 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	384.0 ft³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded

Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	1.827e-18	5.663e-18	1.522e-20	4.717e-20
0.0322	2.428e+04	8.374e-18	2.653e-17	6.739e-20	2.135e-19
0.0364	8.835e+03	8.259e-15	3.316e-14	4.693e-17	1.884e-16
0.6616	5.719e+05	3.852e-03	1.094e-02	7.467e-06	2.121e-05
TOTALS:	6.182e+05	3.852e-03	1.094e-02	7.467e-06	2.121e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CSPUB.MS5
Case Title: B25CSPUB
This case was run on Sunday, June 1, 1997 at 11:49:27 AM
Dose Point # 1 - (18,2,6) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	5.821e-003	1.653e-002
Photon Energy Fluence Rate	MeV/cm ² /sec	3.852e-003	1.094e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	7.467e-006	2.121e-005
Absorbed Dose Rate in Air	mGy/hr	6.519e-008	1.851e-007
"	mrads/hr	6.519e-006	1.851e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.718e-008	2.192e-007
o Opposed	"	6.179e-008	1.755e-007
o Rotational	"	6.179e-008	1.755e-007
o Isotropic	"	5.464e-008	1.552e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	8.203e-008	2.330e-007
o Opposed	"	7.791e-008	2.213e-007
o Rotational	"	7.791e-008	2.213e-007
o Isotropic	"	5.841e-008	1.659e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	6.825e-008	1.938e-007
o Posterior/Anterior	"	6.024e-008	1.711e-007
o Lateral	"	4.467e-008	1.269e-007
o Rotational	"	5.383e-008	1.529e-007
o Isotropic	"	4.583e-008	1.301e-007

#243

Page : 1
DOS File : B25SPUB.MS5
Run Date : June 1, 1997
Run Time: 11:24:33 AM
Duration : 00:01:14

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SPUBLIC
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Public 100,12,75 Ft
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	3535.68 cm 116 ft	60.96 cm 2 ft	91.44 cm 3 ft
# 2	853.44 cm 28 ft 0.0 in	60.96 cm 2 ft	91.44 cm 3 ft
# 3	2773.68 cm 91 ft	60.96 cm 2 ft	91.44 cm 3 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded

Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup

The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (116,2,3) ft

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	2.270e-20	1.378e-19	1.891e-22	1.148e-21
0.0322	2.428e+04	1.040e-19	6.490e-19	8.373e-22	5.223e-21
0.0364	8.835e+03	9.945e-17	8.236e-16	5.650e-19	4.679e-18
0.6616	5.719e+05	2.879e-05	9.685e-05	5.581e-08	1.878e-07
TOTALS:	6.182e+05	2.879e-05	9.685e-05	5.581e-08	1.878e-07

Results - Dose Point # 2 - (28,2,3) ft

Page : 2
 DOS File : B25SPUB.MS5
 Run Date: June 1, 1997
 Run Time: 11:24:33 AM
 Duration : 00:01:14

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	2.836e-18	1.701e-17	2.362e-20	1.417e-19
0.0322	2.428e+04	1.294e-17	7.970e-17	1.041e-19	6.414e-19
0.0364	8.835e+03	1.189e-14	9.657e-14	6.758e-17	5.487e-16
0.6616	5.719e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05
TOTALS:	6.182e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05

Results - Dose Point # 3 - (91,2,3) ft

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	5.298e-20	3.200e-19	4.413e-22	2.665e-21
0.0322	2.428e+04	2.418e-19	1.501e-18	1.946e-21	1.208e-20
0.0364	8.835e+03	2.229e-16	1.832e-15	1.267e-18	1.041e-17
0.6616	5.719e+05	5.486e-05	1.775e-04	1.064e-07	3.441e-07
TOTALS:	6.182e+05	5.486e-05	1.775e-04	1.064e-07	3.441e-07

MicroShield v5.01 (5.01-00009)
 Brookhaven National Laboratory
 Conversion of calculated exposure in air to dose
 FILE: C:\MS5\DATA\B25SPUB.MS5

Case Title: B25SPUBLIC

This case was run on Sunday, June 1, 1997 at 11:24:33 AM

Dose Point # 1 - (116,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	4.351e-005	1.464e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	2.879e-005	9.685e-005
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	5.581e-008	1.878e-007
Absorbed Dose Rate in Air	mGy/hr	4.873e-010	1.639e-009
"	mrad/hr	4.873e-008	1.639e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.769e-010	1.941e-009
o Opposed	"	4.619e-010	1.554e-009
o Rotational	"	4.619e-010	1.554e-009
o Isotropic	"	4.084e-010	1.374e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.131e-010	2.063e-009
o Opposed	"	5.824e-010	1.959e-009
o Rotational	"	5.824e-010	1.959e-009
o Isotropic	"	4.366e-010	1.469e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	5.101e-010	1.716e-009 #1
o Posterior/Anterior	"	4.502e-010	1.515e-009
o Lateral	"	3.339e-010	1.123e-009
o Rotational	"	4.024e-010	1.354e-009
o Isotropic	"	3.425e-010	1.152e-009

MicroShield v5.01 (5.01-00009)
 Brookhaven National Laboratory
 Conversion of calculated exposure in air to dose
 FILE: C:\MS5\DATA\B25SPUB.MS5

Case Title: B25SPUBLIC

This case was run on Sunday, June 1, 1997 at 11:24:33 AM

Dose Point # 3 - (91,2,3) ft

<u>Results (Summed over energies)</u>	<u>Units</u>	<u>Without Buildup</u>	<u>With Buildup</u>
Photon Fluence Rate (flux)	Photons/cm ² /sec	8.291e-005	2.682e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	5.486e-005	1.775e-004
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.064e-007	3.441e-007
Absorbed Dose Rate in Air	mGy/hr	9.285e-010	3.004e-009
"	mrads/hr	9.285e-008	3.004e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.099e-009	3.556e-009
o Opposed	"	8.801e-010	2.847e-009
o Rotational	"	8.801e-010	2.847e-009
o Isotropic	"	7.783e-010	2.518e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.168e-009	3.780e-009
o Opposed	"	1.110e-009	3.590e-009
o Rotational	"	1.110e-009	3.590e-009
o Isotropic	"	8.320e-010	2.692e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	9.720e-010	3.145e-009
o Posterior/Anterior	"	8.580e-010	2.776e-009
o Lateral	"	6.362e-010	2.058e-009
o Rotational	"	7.667e-010	2.480e-009 } #2 & 3
o Isotropic	"	6.527e-010	2.112e-009

Page : 1
DOS File : B25SSPUB.MS5
Run Date: June 1, 1997
Run Time: 11:32:43 AM
Duration : 00:00:24

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SSPUB
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Public 12 Ft Side
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	182.88 cm	6 ft
Width	487.68 cm	16 ft
Height	121.92 cm	4 ft

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	548.64 cm 18 ft	60.96 cm 2 ft	182.88 cm 6 ft

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	384.0 ft ³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap	.	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.0318	1.316e+04	4.583e-18	2.720e-17	3.818e-20	2.266e-19
0.0322	2.428e+04	2.065e-17	1.259e-16	1.662e-19	1.014e-18
0.0364	8.835e+03	1.792e-14	1.448e-13	1.018e-16	8.226e-16
0.6616	5.719e+05	5.284e-03	1.541e-02	1.024e-05	2.987e-05
TOTALS:	6.182e+05	5.284e-03	1.541e-02	1.024e-05	2.987e-05

Dose to Public from Transport and Disposal of Contaminated Soil: Spreadsheets

[illegible]

Dose to Public from Transport and Offsite Disposal to 100 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations									File PUBTRANS wb3
#1 Tailgate Dose to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Cs 137 Geometric Avg. (pCi/g) 2303	Tailgate Time Fraction 0.18	Trip Time (hours) 44	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.002180	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	0.18	44	2	498	0.045670	Hanford < Dose w Arithmetic Avg.	
	0.00000012								
#1 Tailgate Dose to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 103	Tailgate Time Fraction 0.15	Trip Time (hours) 35	No. of Persons Exposed (persons) 2	No. Truck Trips 168	Collective Dose (person-rem) 0.000031	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 2150	0.15	35	2	168	0.000652	Envirocare < Dose w Arithmetic Avg.	
	0.00000017								
#2 Dose Cars In Traffic to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 2303	No. Traffic Jams 4	Stop Time (hours) 0.5	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.058223	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	4	0.5	2	498	1.219586	Hanford < Dose w Arithmetic Avg.	
	0.00001269								
#2 Dose Cars In Traffic to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 103	No. Traffic Jams 3	Stop Time (hours) 0.5	No. of Persons Exposed (persons) 2	No. Truck Trips 168	Collective Dose (person-rem) 0.000928	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 2150	3	0.5	2	168	0.019384	Envirocare < Dose w Arithmetic Avg.	
	0.00001787								
#3 Truck Stop Adjacent Driver Dose to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 2303	Stop Time (hours) 1	Stops /Trip 8	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.232891	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	1	8	2	498	4.878342	Hanford < Dose w Arithmetic Avg.	
	0.00001269								
#3 Truck Stop Adjacent Driver Dose to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 103	Stop Time (hours) 1	Stops/ Trip 6	No. of Persons Exposed (persons) 2	No. Truck Trips 168	Collective Dose (person-rem) 0.003711	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 2150	1	6	2	168	0.077456	Envirocare < Dose w Arithmetic Avg.	
	0.00001787								
#4 Dose to Gas Station Attendant to Hanford Cleanup to 100 mrem/yr	B-25C Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 2303	Stop Time (hours) 0.33	Miles/Tank 600	Miles / Trip 2806	No. Truck Trips 498	No. Persons Exposed 6	Collective Dose (person-rem) 0.001848	Hanford < Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48248	0.33	600	2806	498	6	0.038712	Hanford < Dose w Arithmetic Avg.
	0.00000017								
#4 Dose to Gas Station Attendant to Envirocare Cleanup to 100 mrem/yr	B-25S Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g) 103	Stop Time (hours) 0.33	Miles/Tank 600	Miles / Trip 2245	No. Truck Trips 168	No. Persons Exposed 6	Collective Dose (person-rem) 0.000032	Envirocare < Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 2150	0.33	600	2245	168	6	0.000664	Envirocare < Dose w Arithmetic Avg.
	0.00000025								
Total Mileage: 1774548						Sub Total Hanford			
Vehicle Accident Deaths: 0.007						0.295142 < Dose w Geometric Avg.			
						Sub Total Hanford			
						6.182309 < Dose w Arithmetic Avg.			
						Sub Total Envirocare			
						0.004701 < Dose w Geometric Avg.			
						Sub Total Envirocare			
						0.098136 < Dose w Arithmetic Avg.			
						Grand Total			
						0.299884 < Dose w Geometric Avg.			
						Grand Total			
						6.28044 < Dose w Arithmetic Avg.			

Dose to Public from Transport and Off-site Disposal to 75 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations									File: PUBTRANS.wb3
#1 Tailgate Dose to Hanford Cleanup to 75 mrem/yr	B-25C Dose Rate @ 100 Ft (mrem/hr per pCi/g) 0.00000012	Cs 137							
		Geometric Avg. (pCi/g) 2303	Tailgate Time Fraction 0.18	Trip Time (hours) 44	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.002180	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	0.18	44	2	498	0.045670	Hanford < Dose w Arithmetic Avg.	
#1 Tailgate Dose to Envirocare Cleanup to 75 mrem/yr	B-25S Dose Rate @ 100 Ft (mrem/hr per pCi/g) 0.00000017	Geometric Avg. (pCi/g) 90	Tailgate Time Fraction 0.15	Trip Time (hours) 35	No. of Persons Exposed (persons) 2	No. Truck Trips 250	Collective Dose (person-rem) 0.000041	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 1878	0.15	35	2	250	0.000847	Envirocare < Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford Cleanup to 75 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00001269	Geometric Avg. (pCi/g) 2303	No. Traffic Jams 4	Stop Time (hours) 0.5	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.058223	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	4	0.5	2	498	1.219588	Hanford < Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare Cleanup to 75 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00001787	Geometric Avg. (pCi/g) 90	No. Traffic Jams 3	Stop Time (hours) 0.5	No. of Persons Exposed (persons) 2	No. Truck Trips 250	Collective Dose (person-rem) 0.001208	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 1878	3	0.5	2	250	0.025143	Envirocare < Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford Cleanup to 75 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00001269	Geometric Avg. (pCi/g) 2303	Stop Time (hours) 1	Stops / Trip 8	No. of Persons Exposed (persons) 2	No. Truck Trips 498	Collective Dose (person-rem) 0.232891	Hanford < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 48248	1	8	2	498	4.578342	Hanford < Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare Cleanup to 75 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g) 0.00001787	Geometric Avg. (pCi/g) 90	Stop Time (hours) 1	Stops/ Trip 6	No. of Persons Exposed (persons) 2	No. Truck Trips 250	Collective Dose (person-rem) 0.004825	Envirocare < Dose w Geometric Avg.	
		Arithmetic Avg. (pCi/g) 1878	1	6	2	250	0.100572	Envirocare < Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendant to Hanford Cleanup to 75 mrem/yr	B-25C Dose Rate @ 75 Ft (mrem/hr per pCi/g) 0.00000017	Geometric Avg. (pCi/g) 2303	Stop Time (hours) 0.33	Miles/Tank 600	Miles / Trip 2806	No. Truck Trips 498	No. Persons Exposed 6	Collective Dose (person-rem) 0.001848	Hanford < Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 48248	0.33	600	2806	498	6	0.038712	Hanford < Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendant to Envirocare Cleanup to 75 mrem/yr	B-25S Dose Rate @ 75 Ft (mrem/hr per pCi/g) 0.00000025	Geometric Avg. (pCi/g) 90	Stop Time (hours) 0.33	Miles/Tank 600	Miles / Trip 2245	No. Truck Trips 250	No. Persons Exposed 6	Collective Dose (person-rem) 0.000041	Envirocare < Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g) 1878	0.33	600	2245	250	6	0.000862	Envirocare < Dose w Arithmetic Avg.
Total Mileage: 1958538						Sub Total Hanford			
Vehicle Accident Deaths: 0.008						0.295142 < Dose w Geometric Avg.			
						Sub Total Hanford			
						6.182309 < Dose w Arithmetic Avg.			
						Sub Total Envirocare			
						0.006113 < Dose w Geometric Avg.			
						Sub Total Envirocare			
						0.127424 < Dose w Arithmetic Avg.			
						Grand Total			
						0.30125 < Dose w Geometric Avg.			
						Grand Total			
						6.30973 < Dose w Arithmetic Avg.			

Dose to Public from Transport and Off-site Disposal to 25 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations								
File: PUBTRANS.wb3								
#1 Tailgate Dose to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Ca 137 Geometric Avg. (pCi/g)	Tailgate Time Fraction	Trip Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00000012	2303	0.18	44	2	498	0.002180	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00000012	48246	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.
#1 Tailgate Dose to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Tailgate Time Fraction	Trip Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00000017	47	0.15	35	2	1185	0.000101	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00000017	993	0.15	35	2	1185	0.002125	< Dose w Arithmetic Avg.
#2 Dose Cars in Traffic to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	No. Traffic Jams	Stop Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00001269	48246	4	0.5	2	498	1.218588	< Dose w Arithmetic Avg.
#2 Dose Cars in Traffic to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	No. Traffic Jams	Stop Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001787	47	3	0.5	2	1185	0.002888	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00001787	993	3	0.5	2	1185	0.063083	< Dose w Arithmetic Avg.
#3 Truck Stop Adjacent Driver Dose to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Stops/Trip	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00001269	48246	1	8	2	498	4.878342	< Dose w Arithmetic Avg.
#3 Truck Stop Adjacent Driver Dose to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Stops/Trip	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare
	0.00001787	47	1	6	2	1185	0.011943	< Dose w Geometric Avg.
		Arithmetic Avg. (pCi/g)						
	0.00001787	993	1	6	2	1185	0.252333	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendant to Hanford Cleanup to 25 mrem/yr	B-25C Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose (person-rem)
	0.00000017	2303	0.33	600	2806	498	6	0.001848
		Arithmetic Avg. (pCi/g)						
	0.00000017	48246	0.33	600	2806	498	6	0.038712
#4 Dose to Gas Station Attendant to Envirocare Cleanup to 25 mrem/yr	B-25S Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose (person-rem)
	0.00000025	47	0.33	600	2245	1185	6	0.000102
		Arithmetic Avg. (pCi/g)						
	0.00000025	993	0.33	600	2245	1185	6	0.002162
Total Mileage: 4057713								Sub Total Hanford
Vehicle Accident Deaths: 0.016								0.295142
								< Dose w Geometric Avg.
								Sub Total Hanford
								6.182309
								< Dose w Arithmetic Avg.
								Sub Total Envirocare
								0.015132
								< Dose w Geometric Avg.
								Sub Total Envirocare
								0.319703
								< Dose w Arithmetic Avg.
								Grand Total
								0.31027
								< Dose w Geometric Avg.
								Grand Total
								6.50201
								< Dose w Arithmetic Avg.

Dose to Public from Transport and Off-site Disposal to 1 mrem/yr: Volume Weighted Arithmetic & Geometric Average Concentrations									File PUBTRANS w03
#1 Tailgate Dose to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Tailgate Time Fraction	Trip Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford	
		0.00000012	2303	0.18	44	2	498	0.002180 < Dose w Geometric Avg.	
	0.00000012	Arithmetic Avg. (pCi/g)						Hanford	
		48248	0.18	44	2	498	0.045670 < Dose w Arithmetic Avg.		
#1 Tailgate Dose to Envirocare Cleanup to 1 mrem/yr	B-25C Dose Rate @ 100 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Tailgate Time Fraction	Trip Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare	
		0.00000017	14	0.15	35	2	6026	0.000152 < Dose w Geometric Avg.	
	0.00000017	Arithmetic Avg. (pCi/g)						Envirocare	
		302	0.15	35	2	6026	0.003287 < Dose w Arithmetic Avg.		
#2 Dose Cars in Traffic to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	No. Traffic Jams	Stop Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford	
		0.00001269	2303	4	0.5	2	498	0.056223 < Dose w Geometric Avg.	
	0.00001269	Arithmetic Avg. (pCi/g)						Hanford	
		48248	4	0.5	2	498	1.218588 < Dose w Arithmetic Avg.		
#2 Dose Cars in Traffic to Envirocare Cleanup to 1 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	No. Traffic Jams	Stop Time (hours)	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare	
		0.00001787	14	3	0.5	2	6026	0.004523 < Dose w Geometric Avg.	
	0.00001787	Arithmetic Avg. (pCi/g)						Envirocare	
		302	3	0.5	2	6026	0.097562 < Dose w Arithmetic Avg.		
#3 Truck Stop Adjacent Driver Dose to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Stops / Trip	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Hanford	
		0.00001269	2303	1	8	2	498	0.232891 < Dose w Geometric Avg.	
	0.00001269	Arithmetic Avg. (pCi/g)						Hanford	
		48248	1	8	2	498	4.878342 < Dose w Arithmetic Avg.		
#3 Truck Stop Adjacent Driver Dose to Envirocare Cleanup to 1 mrem/yr	B-25C Dose Rate @ 12 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Stops / Trip	No. of Persons Exposed (persons)	No. Truck Trips	Collective Dose (person-rem)	Envirocare	
		0.00001787	14	1	6	2	6026	0.018091 < Dose w Geometric Avg.	
	0.00001787	Arithmetic Avg. (pCi/g)						Envirocare	
		302	1	6	2	6026	0.390249 < Dose w Arithmetic Avg.		
#4 Dose to Gas Station Attendant to Hanford Cleanup to 1 mrem/yr	B-25C Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose (person-rem)	
		0.00000017	2303	0.33	600	2806	498	6	0.001848 < Dose w Geometric Avg.
	0.00000017	Arithmetic Avg. (pCi/g)						Hanford	
		48248	0.33	600	2806	498	6	0.038712 < Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendant to Envirocare Cleanup to 1 mrem/yr	B-25C Dose Rate @ 75 Ft (mrem/hr per pCi/g)	Geometric Avg. (pCi/g)	Stop Time (hours)	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose (person-rem)	
		0.00000025	14	0.33	600	2245	6026	6	0.000155 < Dose w Geometric Avg.
	0.00000025	Arithmetic Avg. (pCi/g)						Envirocare	
		302	0.33	600	2245	6026	6	0.003344 < Dose w Arithmetic Avg.	
					Total Mileage:	14925758			
					Vehicle Accident Deaths:	0.060			
								Sub Total Hanford	
								0.295142 < Dose w Geometric Avg.	
								Sub Total Hanford	
								6.182309 < Dose w Arithmetic Avg.	
								Sub Total Envirocare	
								0.022921 < Dose w Geometric Avg.	
								Sub Total Envirocare	
								0.494442 < Dose w Arithmetic Avg.	
								Grand Total	
								0.31806 < Dose w Geometric Avg.	
								Grand Total	
								6.67878 < Dose w Arithmetic Avg.	

Appendix I

Dose to Basement Resident for the Failure of Active Controls Scenario: RESRAD Printouts and Spreadsheets

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Attachment A
Calculation Package for Residual Radioactive Material
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Dose Conversion Factor (and Related) Parameter Summary
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Ax-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Su-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Su-154	2.860E-04	2.860E-04	DCF2(7)
B-1	Su-155	4.140E-05	4.140E-05	DCF2(8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(9)
B-1	H-3	6.400E-08	6.400E-08	DCF2(10)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(11)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(12)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(13)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(14)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(15)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(16)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(17)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(18)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(19)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(20)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(21)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(22)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(23)
B-1	U-233	1.350E-01	1.350E-01	DCF2(24)
B-1	U-234	1.320E-01	1.320E-01	DCF2(25)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(26)
B-1	U-236	1.250E-01	1.250E-01	DCF2(27)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(28)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Ax-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Su-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Su-154	9.550E-06	9.550E-06	DCF3(7)
D-1	Su-155	1.530E-06	1.530E-06	DCF3(8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(9)
D-1	H-3	6.400E-08	6.400E-08	DCF3(10)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(11)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(12)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(13)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(14)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(15)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(16)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(17)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(18)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(19)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(20)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(21)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Th-230	5.480E-04	5.480E-04	DCF3(22)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(23)
D-1	U-233	2.890E-04	2.890E-04	DCF3(24)
D-1	U-234	2.830E-04	2.830E-04	DCF3(25)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(26)
D-1	U-236	2.690E-04	2.690E-04	DCF3(27)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(28)
D-34	Food transfer factors:			
D-34	Ac-227+D, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Am-241, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Co-60, plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Eu-152, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34				
D-34	Eu-154, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Eu-154, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Eu-154, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34				
D-34	Eu-155, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	Eu-155, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(8,2)
D-34	Eu-155, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(8,3)
D-34				
D-34	Gd-152, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	Gd-152, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,2)
D-34	Gd-152, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(9,3)
D-34				
D-34	H-3, plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(10,1)
D-34	H-3, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(10,2)
D-34	H-3, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(10,3)
D-34				
D-34	Np-237+D, plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(11,1)
D-34	Np-237+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Np-237+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(12,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(12,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(12,3)
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(13,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(13,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(13,3)
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(14,3)
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(15,3)
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(16,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(17,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,3)
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(18,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,3)
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(19,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(19,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(19,3)
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(20,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(20,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(20,3)
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(21,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(21,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(21,3)
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(22,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(22,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(22,3)
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(23,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(23,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(23,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(24,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(24,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(24,3)
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(25,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(25,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(25,3)
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(26,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(26,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(26,3)
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(27,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(27,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(27,3)
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(28,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(28,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(28,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC(7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC(8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(8,2)
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(9,2)
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(10,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(10,2)
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(11,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Pa-231, fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	Pa-231, crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(12,2)
D-5	Pb-210+D, fish	3.000E+02	3.000E+02	BIOFAC(13,1)
D-5	Pb-210+D, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5	Pu-238, fish	3.000E+01	3.000E+01	BIOFAC(14,1)
D-5	Pu-238, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(14,2)
D-5	Pu-239, fish	3.000E+01	3.000E+01	BIOFAC(15,1)
D-5	Pu-239, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5	Pu-240, fish	3.000E+01	3.000E+01	BIOFAC(16,1)
D-5	Pu-240, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(16,2)
D-5	Ra-226+D, fish	5.000E+01	5.000E+01	BIOFAC(17,1)
D-5	Ra-226+D, crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(17,2)
D-5	Ra-228+D, fish	5.000E+01	5.000E+01	BIOFAC(18,1)
D-5	Ra-228+D, crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(18,2)
D-5	Sr-90+D, fish	6.000E+01	6.000E+01	BIOFAC(19,1)
D-5	Sr-90+D, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(19,2)
D-5	Th-228+D, fish	1.000E+02	1.000E+02	BIOFAC(20,1)
D-5	Th-228+D, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(20,2)
D-5	Th-229+D, fish	1.000E+02	1.000E+02	BIOFAC(21,1)
D-5	Th-229+D, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(21,2)
D-5	Th-230, fish	1.000E+02	1.000E+02	BIOFAC(22,1)
D-5	Th-230, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(22,2)
D-5	Th-232, fish	1.000E+02	1.000E+02	BIOFAC(23,1)
D-5	Th-232, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(23,2)
D-5	U-233, fish	1.000E+01	1.000E+01	BIOFAC(24,1)
D-5	U-233, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(24,2)
D-5	U-234, fish	1.000E+01	1.000E+01	BIOFAC(25,1)
D-5	U-234, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(25,2)
D-5	U-235+D, fish	1.000E+01	1.000E+01	BIOFAC(26,1)
D-5	U-235+D, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(26,2)
D-5	U-236, fish	1.000E+01	1.000E+01	BIOFAC(27,1)
D-5	U-236, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(27,2)

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 Summary : Bldg. 455 Failure of Institutional Controls: Topsoil 0.16m 75 mrem/yr
 File : C:\RES561\OU_I\B445TOP.DAT

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current		Default		Parameter Name
		Value				
D-5	U-238+D , fish	1.000E+01		1.000E+01		BIOFAC(28,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01		6.000E+01		BIOFAC(28,2)

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)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.600E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.500E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	7.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+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)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.000E+00	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Eu-154	1.000E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.000E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): H-3	1.000E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	S1(15)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	S1(16)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(25)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	S1(26)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(28)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(14)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(15)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(16)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(17)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(19)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(25)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(26)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(28)
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)	1.660E+00	1.500E+00	---	DENSCZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VZCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	6.600E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+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)	1.800E+01	1.000E+01	---	DWISWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-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)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241	---	---	---	---
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC(2)
R016	Unsat. zone 1 (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.331E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60	---	---	---	---
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC(3)
R016	Unsat. zone 1 (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.208E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCC (4)
R016	Unsaturated zone 1 (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCU (4,1)
R016	Saturated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCS (4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.030E-03	ALEACH (4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (4)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCC (5)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCU (5,1)
R016	Saturated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCS (5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH (5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (5)
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCC (7)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCU (7,1)
R016	Saturated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCS (7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH (7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCC (8)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCU (8,1)
R016	Saturated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCS (8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH (8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (8)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU (10,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS (10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.553E+01	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCU (14,1)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS (14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCU (15,1)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS (15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)

Site-Specific Parameter Summary (continued)

Menu	Parameter	Used	Default	(If different from user input)	Name
R016	Distribution coefficients for Pu-240	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	5.500E+02	2.000E+03	D016UC(16)
R016	Unsaturated zone 1 (cm**3/g)	☐	5.500E+02	2.000E+03	D016US(16)
R016	Saturated zone 1 (cm**3/g)	☐	5.500E+02	2.000E+03	D016SC(16)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(16)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(16)
R016	Distribution coefficients for Ra-226	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	5.000E+02	7.000E+01	D016UC(17)
R016	Unsaturated zone 1 (cm**3/g)	☐	5.000E+02	7.000E+01	D016US(17)
R016	Saturated zone 1 (cm**3/g)	☐	5.000E+02	7.000E+01	D016SC(17)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(17)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(17)
R016	Distribution coefficients for Sr-90	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	3.000E+00	3.000E+01	D016UC(19)
R016	Unsaturated zone 1 (cm**3/g)	☐	3.000E+00	3.000E+01	D016US(19)
R016	Saturated zone 1 (cm**3/g)	☐	3.000E+00	3.000E+01	D016SC(19)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(19)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(19)
R016	Distribution coefficients for U-234	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016UC(25)
R016	Unsaturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016US(25)
R016	Saturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016SC(25)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(25)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(25)
R016	Distribution coefficients for U-235	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016UC(26)
R016	Unsaturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016US(26)
R016	Saturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016SC(26)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(26)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(26)
R016	Distribution coefficients for U-238	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016UC(28)
R016	Unsaturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016US(28)
R016	Saturated zone 1 (cm**3/g)	☐	1.700E+01	5.000E+01	D016SC(28)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(28)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(28)
R016	Distribution coefficients for daughter Ac-227	☐	☐	☐	
R016	Contaminated zone 1 (cm**3/g)	☐	4.500E+02	2.000E+01	D016UC(1)
R016	Unsaturated zone 1 (cm**3/g)	☐	4.500E+02	2.000E+01	D016US(1)
R016	Saturated zone 1 (cm**3/g)	☐	4.500E+02	2.000E+01	D016SC(1)
R016	Leach rate (/yr)	☐	0.000E+00	0.000E+00	AL016C(1)
R016	Solubility constant	☐	0.000E+00	0.000E+00	S016BK(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	0-1.000E+00	0-1.000E+00	5.758E+02	DQNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	0-1.000E+00	0-1.000E+00	5.758E+02	DQNUCU(9,1)
R016	Saturated zone (cm**3/g)	0-1.000E+00	0-1.000E+00	5.758E+02	DQNUCS(9)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	4.392E-03	ALEACH(9)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	0 5.000E+00	0-1.000E+00	---	DQNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	0 5.000E+00	0-1.000E+00	---	DQNUCU(11,1)
R016	Saturated zone (cm**3/g)	0 5.000E+00	0-1.000E+00	---	DQNUCS(11)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	4.960E-01	ALEACH(11)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	0 5.500E+02	0 5.000E+01	---	DQNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	0 5.500E+02	0 5.000E+01	---	DQNUCU(12,1)
R016	Saturated zone (cm**3/g)	0 5.500E+02	0 5.000E+01	---	DQNUCS(12)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	4.598E-03	ALEACH(12)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	0 2.700E+02	0 1.000E+02	---	DQNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	0 2.700E+02	0 1.000E+02	---	DQNUCU(13,1)
R016	Saturated zone (cm**3/g)	0 2.700E+02	0 1.000E+02	---	DQNUCS(13)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	9.364E-03	ALEACH(13)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	0 5.000E+02	0 7.000E+01	---	DQNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	0 5.000E+02	0 7.000E+01	---	DQNUCU(18,1)
R016	Saturated zone (cm**3/g)	0 5.000E+02	0 7.000E+01	---	DQNUCS(18)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	5.057E-03	ALEACH(18)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCU(20,1)
R016	Saturated zone (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCS(20)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	7.904E-04	ALEACH(20)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCU(21,1)
R016	Saturated zone (cm**3/g)	0 3.200E+03	0 6.000E+04	---	DQNUCS(21)
R016	Leach rate (/yr)	0 0.000E+00	0 0.000E+00	7.904E-04	ALEACH(21)
R016	Solubility constant	0 0.000E+00	0 0.000E+00	not used	SOLUBK(21)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(24)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(24,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(24)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(24)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(24)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(27)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(27,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(27)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(27)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(27)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-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	4.000E-01	4.000E-01	---	SF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+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)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	5.000E-01	---	FIRW
R018	Contamination fraction of aquatic food	2.000E-01	0-1	---	FR9
R018	Contamination fraction of plant food	not used	0-1	---	FPLANT
R018	Contamination fraction of meat	not used	0-1	---	FMEAT
R018	Contamination fraction of milk	not used	0-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	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	---	FGNDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	0.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	CL2WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	CL2CZ
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	---	EMC
C14	C-14 evasion flux rate from soil (l/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (l/sec)	not used	1.000E-10	---	REVSIN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):	---	---	---	---
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	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	3.000E-02	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	3.000E-07	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)	6.230E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	1.000E+00	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	1.500E-01	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	☐	suppressed
5 -- milk ingestion	☐	suppressed
6 -- aquatic foods	☐	suppressed
7 -- drinking water	☐	active
8 -- soil ingestion	☐	active
9 -- radon	☐	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
*****		*****	
Area:	52000.00 square meters	Am-241	1.000E+00
Thickness:	0.16 meters	Co-60	1.000E+00
Cover Depth:	0.00 meters	Cs-137	1.000E+00
		Su-152	1.000E+00
		Su-154	1.000E+00
		Su-155	1.000E+00
		H-3	1.000E+00
		Pu-238	1.000E+00
		Pu-239	1.000E+00
		Pu-240	1.000E+00
		Ra-226	1.000E+00
		Sr-90	1.000E+00
		U-234	1.000E+00
		U-235	1.000E+00
		U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 75 mrem/yr

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

t (years):	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
TDOSE(t):	2.895E+01	2.649E+01	1.979E+01	1.511E+01	8.684E+00	6.186E+00	3.065E+00	5.296E-04	5.383E-04	5.517E-04
M(t):	3.859E-01	3.532E-01	2.639E-01	2.014E-01	1.158E-01	8.248E-02	4.087E-02	7.061E-06	7.177E-06	7.356E-06

Maximum TDOSE(t): 2.895E+01 mrem/yr at t = 0.000E+00 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 = 5.000E+01 years

x 0.508 Basement Dec/Shielding Conversion Factor
 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.
Am-241	1.230E-02	0.0039	9.116E-02	0.0147	0.000E+00	0.0000	1.393E-02	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	7.572E-02	0.012
Co-60	1.377E-03	0.0002	8.856E-09	0.0000	0.000E+00	0.0000	1.550E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.102E-07	0.000
Cs-137	3.670E-01	0.0593	1.521E-06	0.0000	0.000E+00	0.0000	1.706E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	2.416E-04	0.000
Eu-152	2.160E-01	0.0349	3.139E-06	0.0000	0.000E+00	0.0000	4.177E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.324E-06	0.000
Eu-154	6.176E-02	0.0100	1.065E-06	0.0000	0.000E+00	0.0000	1.613E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.604E-06	0.000
Eu-155	8.457E-05	0.0000	7.310E-09	0.0000	0.000E+00	0.0000	1.222E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.737E-08	0.000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.000
Pu-238	5.194E-05	0.0000	4.990E-02	0.0081	6.248E-12	0.0000	7.591E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	4.127E-02	0.006
Pu-239	1.405E-04	0.0000	8.094E-02	0.0131	0.000E+00	0.0000	1.245E-02	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.010
Pu-240	7.483E-05	0.0000	8.063E-02	0.0130	6.802E-17	0.0000	1.240E-02	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	6.741E-02	0.010
Ra-226	4.351E+00	0.7034	4.632E-03	0.0007	8.737E-02	0.0141	3.463E-01	0.0560	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-01	0.019
Sr-90	8.292E-21	0.0000	1.798E-22	0.0000	0.000E+00	0.0000	1.126E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.127E-21	0.000
U-234	5.889E-06	0.0000	2.382E-05	0.0000	1.143E-07	0.0000	2.378E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.065E-06	0.000
U-235	3.872E-04	0.0001	1.896E-04	0.0000	0.000E+00	0.0000	6.849E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.420E-05	0.000
U-238	4.535E-05	0.0000	1.723E-05	0.0000	1.880E-12	0.0000	1.786E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.978E-06	0.000
Total	5.022E+00	0.8119	3.075E-01	0.0497	8.737E-02	0.0141	3.944E-01	0.0638	0.000E+00	0.0000	0.000E+00	0.0000	3.745E-01	0.060

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 5.000E+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.
Am-241	2.436E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.129E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.051E-01	0.033
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.378E-03	0.000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.689E-01	0.059
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.161E-01	0.034
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.177E-02	0.010
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.462E-05	0.000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.000
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.881E-02	0.016
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.612E-01	0.026
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.605E-01	0.025
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.911E+00	0.794
Sr-90	7.747E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.409E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.988E-08	0.000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.727E-05	0.000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.095E-04	0.000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.834E-05	0.000
Total	2.444E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.154E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.186E+00	1.000

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

*Subtracted out
annual dose from ground
radiation (indoor) for the
3500 hr resident is
occupying basement*

Parent (i)	Product (j)	Branch Fraction	t=	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00		3.150E-01	3.139E-01	3.097E-01	3.045E-01	2.523E-01	2.050E-01	1.054E-01	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237	1.000E+00		0.000E+00	3.950E-07	9.079E-07	9.580E-07	8.339E-07	2.578E-05	2.516E-05	2.678E-06	1.948E-06	8.786E-07
Am-241	U-233	1.000E+00		0.000E+00	3.507E-14	4.024E-13	7.569E-13	9.061E-13	1.829E-11	2.034E-10	4.384E-11	2.662E-11	1.283E-11
Am-241	Th-229	1.000E+00		0.000E+00	3.496E-17	2.493E-15	1.123E-14	6.281E-14	1.188E-13	2.300E-13	3.268E-13	3.278E-13	3.437E-13
Am-241	ΣDSR(j)			3.150E-01	3.139E-01	3.097E-01	3.045E-01	2.523E-01	2.051E-01	1.055E-01	2.678E-06	1.948E-06	8.786E-07
									1.192E-01				
Co-60	Co-60	1.000E+00		9.191E+00	7.713E+00	3.826E+00	1.591E+00	4.724E-02	1.378E-03	1.737E-07	0.000E+00	4.671E-32	0.000E+00
									6.955E-04				
Cs-137	Cs-137	1.000E+00		2.034E+00	1.968E+00	1.721E+00	1.456E+00	7.385E-01	3.689E-01	5.664E-02	0.000E+00	0.000E+00	0.000E+00
									1.806E-01				
Eu-152	Eu-152	7.208E-01		2.921E+00	2.757E+00	2.188E+00	1.637E+00	5.090E-01	1.557E-01	7.022E-03	0.000E+00	0.000E+00	0.000E+00
									1.063E-01				
Eu-152	Eu-152	2.792E-01		1.132E+00	1.068E+00	8.473E-01	6.341E-01	1.972E-01	6.032E-02	2.720E-03	0.000E+00	0.000E+00	0.000E+00
Eu-152	Gd-152	2.792E-01		0.000E+00	1.507E-16	6.680E-16	1.156E-15	1.788E-15	1.624E-15	7.643E-16	0.000E+00	0.000E+00	0.000E+00
Eu-152	ΣDSR(j)			1.132E+00	1.068E+00	8.473E-01	6.341E-01	1.972E-01	6.032E-02	2.720E-03	0.000E+00	0.000E+00	0.000E+00
Eu-154	Eu-154	1.000E+00		4.421E+00	4.062E+00	2.895E+00	1.895E+00	3.449E-01	6.177E-02	7.329E-04	0.000E+00	0.000E+00	0.000E+00
									3.437E-02				
Eu-155	Eu-155	1.000E+00		1.160E-01	1.004E-01	5.637E-02	2.739E-02	1.527E-03	8.462E-05	5.652E-08	0.000E+00	0.000E+00	0.000E+00
									3.138E-02				
H-3	H-3	1.000E+00		3.816E-03	2.643E-03	1.093E-43	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pu-238	Pu-238	1.000E+00		2.529E-01	2.496E-01	2.370E-01	2.221E-01	1.499E-01	9.881E-02	2.886E-02	0.000E+00	0.000E+00	0.000E+00
Pu-238	U-234	1.000E+00		0.000E+00	1.488E-07	5.483E-07	7.749E-07	6.933E-07	4.648E-07	1.364E-07	2.736E-06	4.476E-07	8.605E-09
Pu-238	Th-230	1.000E+00		0.000E+00	1.556E-12	3.163E-11	1.004E-10	3.791E-10	5.282E-10	4.671E-10	1.183E-10	1.384E-10	1.427E-10
Pu-238	Ra-226	1.000E+00		0.000E+00	1.232E-14	1.305E-12	8.611E-12	1.213E-10	3.314E-10	8.333E-10	3.765E-10	7.135E-10	1.057E-09
Pu-238	Pb-210	1.000E+00		0.000E+00	1.306E-17	5.393E-15	6.756E-14	2.384E-12	8.895E-12	2.575E-11	3.283E-09	6.227E-09	9.240E-09
Pu-238	ΣDSR(j)			2.529E-01	2.496E-01	2.370E-01	2.221E-01	1.499E-01	9.881E-02	2.886E-02	2.740E-06	4.547E-07	1.904E-08
Pu-239	Pu-239	1.000E+00		2.783E-01	2.769E-01	2.713E-01	2.644E-01	2.089E-01	1.612E-01	6.980E-02	0.000E+00	0.000E+00	0.000E+00
Pu-239	U-235	1.000E+00		0.000E+00	4.809E-10	1.805E-09	2.617E-09	3.002E-09	2.664E-09	1.707E-09	2.670E-09	2.181E-09	2.150E-09
Pu-239	Pa-231	1.000E+00		0.000E+00	1.530E-14	3.089E-13	9.746E-13	3.834E-12	5.570E-12	5.448E-12	1.691E-11	2.834E-11	5.580E-11
Pu-239	Ac-227	1.000E+00		0.000E+00	4.453E-16	4.523E-14	2.890E-13	3.308E-12	7.391E-12	1.181E-11	2.663E-11	4.788E-11	9.417E-11
Pu-239	ΣDSR(j)			2.783E-01	2.769E-01	2.713E-01	2.644E-01	2.089E-01	1.612E-01	6.980E-02	2.714E-09	2.258E-09	2.300E-09
Pu-240	Pu-240	1.000E+00		2.782E-01	2.768E-01	2.711E-01	2.642E-01	2.084E-01	1.605E-01	6.923E-02	0.000E+00	0.000E+00	0.000E+00
Pu-240	U-236	1.000E+00		0.000E+00	1.476E-09	5.535E-09	8.028E-09	8.209E-09	6.408E-09	2.772E-09	7.999E-08	6.432E-08	6.101E-08
Pu-240	Th-232	1.000E+00		0.000E+00	4.437E-19	9.159E-18	2.952E-17	1.190E-16	1.772E-16	1.828E-16	5.292E-17	8.824E-17	1.697E-16
Pu-240	Ra-228	1.000E+00		0.000E+00	1.064E-19	1.009E-17	5.834E-17	5.225E-16	1.028E-15	1.610E-15	1.759E-16	2.964E-16	5.706E-16
Pu-240	Th-228	1.000E+00		0.000E+00	1.423E-20	5.464E-18	5.023E-17	6.988E-16	1.497E-15	2.473E-15	1.030E-16	1.066E-16	1.155E-16
Pu-240	ΣDSR(j)			2.782E-01	2.768E-01	2.711E-01	2.642E-01	2.084E-01	1.605E-01	6.923E-02	7.999E-08	6.432E-08	6.101E-08
Ra-226	Ra-226	1.000E+00		6.981E+00	6.930E+00	6.728E+00	6.480E+00	5.525E+00	4.634E+00	2.589E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Pb-210	1.000E+00		0.000E+00	2.318E-02	9.721E-02	1.689E-01	2.874E-01	2.771E-01	1.354E-01	0.000E+00	0.000E+00	0.000E+00
Ra-226	ΣDSR(j)			6.981E+00	6.954E+00	6.826E+00	6.649E+00	5.813E+00	4.911E+00	2.725E+00	0.000E+00	0.000E+00	0.000E+00
									2.491				
									2.778				

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	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	3.046E-01	1.307E-01	4.436E-03	6.453E-05	2.046E-01	<u>7.988E-08</u>	3.749E-26	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	5.680E-02	4.897E-02	2.705E-02	1.288E-02	5.797E-04	2.548E-05	8.566E-09	1.757E-09	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	1.073E-06	4.060E-06	5.976E-06	6.541E-06	5.517E-06	2.908E-06	7.112E-07	7.100E-07	7.068E-07
U-234	Ra-226	1.000E+00	0.000E+00	1.292E-08	2.644E-07	8.429E-07	3.704E-06	6.060E-06	8.276E-06	7.336E-07	1.714E-06	3.805E-06
U-234	Pb-210	1.000E+00	0.000E+00	1.710E-11	1.446E-09	8.870E-09	9.693E-08	2.091E-07	3.015E-07	6.400E-06	1.497E-05	3.328E-05
U-234	ΣDSR(j)		5.680E-02	4.897E-02	2.705E-02	1.288E-02	5.900E-04	<u>3.727E-05</u>	1.149E-05	7.846E-06	1.739E-05	3.780E-05
U-235	U-235	1.000E+00	5.267E-01	4.541E-01	2.507E-01	1.193E-01	6.016E-03	3.001E-04	1.486E-07	1.659E-09	0.000E+00	0.000E+00
U-235	Pa-231	1.000E+00	0.000E+00	3.022E-05	1.121E-04	1.607E-04	1.661E-04	1.314E-04	5.948E-05	1.929E-04	1.920E-04	1.900E-04
U-235	Ac-227	1.000E+00	0.000E+00	1.327E-06	2.564E-05	7.690E-05	2.393E-04	2.780E-04	1.782E-04	3.233E-04	3.264E-04	3.229E-04
U-235	ΣDSR(j)		5.267E-01	4.541E-01	2.509E-01	1.195E-01	6.422E-03	<u>7.095E-04</u>	2.378E-04	5.162E-04	5.184E-04	5.129E-04
U-238	U-238	1.000E+00	1.326E-01	1.142E-01	6.297E-02	2.991E-02	1.440E-03	6.834E-05	2.950E-08	1.672E-09	0.000E+00	0.000E+00
U-238	U-234	1.000E+00	0.000E+00	1.392E-07	3.836E-07	3.652E-07	4.931E-08	3.612E-09	2.429E-12	1.495E-12	0.000E+00	0.000E+00
U-238	Th-230	1.000E+00	0.000E+00	1.487E-12	2.529E-11	6.466E-11	1.192E-10	1.058E-10	5.604E-11	3.079E-10	3.003E-10	3.974E-10
U-238	Ra-226	1.000E+00	0.000E+00	1.191E-14	1.106E-12	6.244E-12	5.242E-11	9.973E-11	1.499E-10	2.336E-09	2.348E-09	3.334E-09
U-238	Pb-210	1.000E+00	0.000E+00	1.269E-17	4.714E-15	5.205E-14	1.187E-12	3.164E-12	5.319E-12	2.012E-08	2.023E-08	2.886E-08
U-238	ΣDSR(j)		1.326E-01	1.142E-01	6.297E-02	2.991E-02	1.440E-03	<u>6.834E-05</u>	2.971E-08	2.444E-08	2.288E-08	3.259E-08

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

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
 Basic Radiation Dose Limit = 75 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	2.381E+02	2.389E+02	2.422E+02	2.463E+02	2.973E+02	3.657E+02	7.112E+02	2.801E+07	3.851E+07	8.537E+07
Co-60	8.160E+00	9.723E+00	1.960E+01	4.713E+01	1.588E+03	5.441E+04	4.317E+08	*1.131E+15	*1.131E+15	*1.131E+15
Cs-137	3.687E+01	3.812E+01	4.357E+01	5.153E+01	1.016E+02	2.033E+02	1.324E+03	*8.701E+13	*8.701E+13	*8.701E+13
Eu-152	1.850E+01	1.961E+01	2.471E+01	3.303E+01	1.062E+02	3.471E+02	7.698E+03	*1.765E+14	*1.765E+14	*1.765E+14
Eu-154	1.696E+01	1.846E+01	2.590E+01	3.958E+01	2.175E+02	1.214E+03	1.023E+05	*2.639E+14	*2.639E+14	*2.639E+14
Eu-155	6.467E+02	7.470E+02	1.330E+03	2.738E+03	4.911E+04	8.863E+05	1.327E+09	*4.651E+14	*4.651E+14	*4.651E+14
H-3	1.965E+04	2.838E+04	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15
Pu-238	2.966E+02	3.004E+02	3.165E+02	3.377E+02	5.003E+02	7.591E+02	2.599E+03	2.738E+07	1.649E+08	3.938E+09
Pu-239	2.695E+02	2.708E+02	2.764E+02	2.836E+02	3.589E+02	4.653E+02	1.074E+03	2.764E+10	3.322E+10	3.260E+10
Pu-240	2.695E+02	2.709E+02	2.766E+02	2.839E+02	3.599E+02	4.673E+02	1.083E+03	9.377E+08	1.166E+09	1.229E+09
Ra-226	1.074E+01	1.079E+01	1.099E+01	1.128E+01	1.290E+01	1.527E+01	2.753E+01	*9.882E+11	*9.882E+11	*9.882E+11
Sr-90	2.462E+02	5.737E+02	1.691E+04	1.162E+06	3.666E+02	9.389E+08	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14
U-234	1.320E+03	1.532E+03	2.773E+03	5.821E+03	1.271E+05	2.012E+06	6.525E+06	9.559E+06	4.313E+06	1.984E+06
U-235	1.424E+02	1.652E+02	2.990E+02	6.274E+02	1.168E+04	1.057E+05	3.154E+05	1.453E+05	1.447E+05	1.462E+05
U-238	5.658E+02	6.566E+02	1.191E+03	2.508E+03	5.207E+04	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05

*At specific activity limit

Attachment B
Calculation Package for Residual Radioactive Material
in the Soil Buried under 3' of Clean Cover

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Dose Conversion Factor (and Related) Parameter Summary
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Eu-154	2.860E-04	2.860E-04	DCF2(7)
B-1	Eu-155	4.140E-05	4.140E-05	DCF2(8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(9)
B-1	H-3	6.400E-08	6.400E-08	DCF2(10)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(11)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(12)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(13)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(14)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(15)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(16)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(17)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(18)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(19)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(20)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(21)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(22)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(23)
B-1	U-233	1.350E-01	1.350E-01	DCF2(24)
B-1	U-234	1.320E-01	1.320E-01	DCF2(25)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(26)
B-1	U-236	1.250E-01	1.250E-01	DCF2(27)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(28)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Eu-154	9.550E-06	9.550E-06	DCF3(7)
D-1	Eu-155	1.530E-06	1.530E-06	DCF3(8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(9)
D-1	H-3	6.400E-08	6.400E-08	DCF3(10)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(11)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(12)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(13)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(14)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(15)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(16)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(17)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(18)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(19)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(20)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(21)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Th-230	5.480E-04	5.480E-04	DCF3 (22)
D-1	Th-232	2.730E-03	2.730E-03	DCF3 (23)
D-1	U-233	2.890E-04	2.890E-04	DCF3 (24)
D-1	U-234	2.830E-04	2.830E-04	DCF3 (25)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3 (26)
D-1	U-236	2.690E-04	2.690E-04	DCF3 (27)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3 (28)
D-34	Food transfer factors:			
D-34	Ac-227+D, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34	Am-241, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34	Co-60, plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34	Cs-137+D, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34	Eu-152, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34	Eu-154, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Eu-154, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Eu-154, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34	Eu-155, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	Eu-155, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(8,2)
D-34	Eu-155, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(8,3)
D-34	Gd-152, plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	Gd-152, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,2)
D-34	Gd-152, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(9,3)
D-34	H-3, plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(10,1)
D-34	H-3, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(10,2)
D-34	H-3, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(10,3)
D-34	Np-237+D, plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(11,1)
D-34	Np-237+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Np-237+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Pa-231, plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(12,1)
D-34	Pa-231, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(12,2)
D-34	Pa-231, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(12,3)
D-34	Pb-210+D, plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(13,1)
D-34	Pb-210+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(13,2)
D-34	Pb-210+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(13,3)
D-34	Pu-238, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Pu-238, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Pu-238, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(14,3)
D-34	Pu-239, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Pu-239, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Pu-239, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(15,3)
D-34	Pu-240, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Pu-240, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Pu-240, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(16,3)
D-34	Ra-226+D, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(17,1)
D-34	Ra-226+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,2)
D-34	Ra-226+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,3)
D-34	Ra-228+D, plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(18,1)
D-34	Ra-228+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,2)
D-34	Ra-228+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,3)
D-34	Sr-90+D, plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(19,1)
D-34	Sr-90+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(19,2)
D-34	Sr-90+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(19,3)
D-34	Th-228+D, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(20,1)
D-34	Th-228+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(20,2)
D-34	Th-228+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(20,3)
D-34	Th-229+D, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(21,1)
D-34	Th-229+D, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(21,2)
D-34	Th-229+D, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(21,3)
D-34	Th-230, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(22,1)
D-34	Th-230, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(22,2)
D-34	Th-230, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(22,3)
D-34	Th-232, plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(23,1)
D-34	Th-232, beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(23,2)
D-34	Th-232, milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(23,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(24,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(24,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(24,3)
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(25,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(25,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(25,3)
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(26,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(26,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(26,3)
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(27,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(27,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(27,3)
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(28,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(28,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(28,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC(7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC(8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(8,2)
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(9,2)
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(10,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(10,2)
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(11,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Pa-231, fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	Pa-231, crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(12,2)
D-5	Pb-210+D, fish	3.000E+02	3.000E+02	BIOFAC(13,1)
D-5	Pb-210+D, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5	Pu-238, fish	3.000E+01	3.000E+01	BIOFAC(14,1)
D-5	Pu-238, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(14,2)
D-5	Pu-239, fish	3.000E+01	3.000E+01	BIOFAC(15,1)
D-5	Pu-239, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5	Pu-240, fish	3.000E+01	3.000E+01	BIOFAC(16,1)
D-5	Pu-240, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(16,2)
D-5	Ra-226+D, fish	5.000E+01	5.000E+01	BIOFAC(17,1)
D-5	Ra-226+D, crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(17,2)
D-5	Ra-228+D, fish	5.000E+01	5.000E+01	BIOFAC(18,1)
D-5	Ra-228+D, crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(18,2)
D-5	Sr-90+D, fish	6.000E+01	6.000E+01	BIOFAC(19,1)
D-5	Sr-90+D, crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(19,2)
D-5	Th-228+D, fish	1.000E+02	1.000E+02	BIOFAC(20,1)
D-5	Th-228+D, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(20,2)
D-5	Th-229+D, fish	1.000E+02	1.000E+02	BIOFAC(21,1)
D-5	Th-229+D, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(21,2)
D-5	Th-230, fish	1.000E+02	1.000E+02	BIOFAC(22,1)
D-5	Th-230, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(22,2)
D-5	Th-232, fish	1.000E+02	1.000E+02	BIOFAC(23,1)
D-5	Th-232, crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(23,2)
D-5	U-233, fish	1.000E+01	1.000E+01	BIOFAC(24,1)
D-5	U-233, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(24,2)
D-5	U-234, fish	1.000E+01	1.000E+01	BIOFAC(25,1)
D-5	U-234, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(25,2)
D-5	U-235+D, fish	1.000E+01	1.000E+01	BIOFAC(26,1)
D-5	U-235+D, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(26,2)
D-5	U-236, fish	1.000E+01	1.000E+01	BIOFAC(27,1)
D-5	U-236, crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(27,2)

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 Summary : Bldg. 445 Failure of Institutional Controls: Soil w 1 m. Cover 75mrem
 File : C:\RES561\OU_I\B445COV.DAT

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: DOSFAC.BIN

☐	☐	☐	☐	☐	☐	☐
Menu	Parameter	Value	Default	Current	Parameter	Name
D-5 ☐ U-238+D , fish		☐ 1.000E+01	☐ 1.000E+01	☐	☐	BIOFAC(28,1)
D-5 ☐ U-238+D , crustacea and mollusks		☐ 6.000E+01	☐ 6.000E+01	☐	☐	BIOFAC(28,2)

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)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	4.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.500E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	7.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	5.000E+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)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.000E+00	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Eu-154	1.000E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.000E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): H-3	1.000E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	S1(15)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	S1(16)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(25)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	S1(26)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(28)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(14)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(15)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(16)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(17)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(19)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(25)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(26)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(28)
R013	Cover depth (m)	1.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.660E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VZCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EP CZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	6.600E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+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)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC (2)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS (2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.324E-05	ALEACH (2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC (3)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS (3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.683E-03	ALEACH (3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCC (4)
R016	Saturated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCS (4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.612E-04	ALEACH (4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (4)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCC (5)
R016	Saturated zone (cm**3/g)	5.800E+02	1.000E+00	---	DCNUCS (5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH (5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (5)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DQNUCC(7)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DQNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DQNUCC(8)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DQNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DQNUCC(10)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DQNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.021E+00	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCC(14)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCC(15)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCC(16)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DQNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DQNUCC(17)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DQNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.023E-04	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DQNUCC(19)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DQNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.264E-02	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCC(25)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCS(25)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(25)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(25)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCC(26)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCS(26)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(26)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(26)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCC(28)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DQNUCS(28)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(28)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(28)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	4.500E+02	2.000E+01	---	DQNUCC(1)
R016	Saturated zone (cm**3/g)	4.500E+02	2.000E+01	---	DQNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.248E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DQNUCC(9)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DQNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.757E-04	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DQNUCC(11)
R016	Saturated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DQNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.984E-02	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.500E+02	5.000E+01	---	DQNUCC(12)
R016	Saturated zone (cm**3/g)	5.500E+02	5.000E+01	---	DQNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	2.700E+02	1.000E+02	---	DQNUCC(13)
R016	Saturated zone (cm**3/g)	2.700E+02	1.000E+02	---	DQNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.746E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCC(18)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.023E-04	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(20)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(21)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(22)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(23)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(24)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(24)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(24)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(24)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(27)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(27)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(27)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(27)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-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	4.000E-01	4.000E-01	---	SF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+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)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+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	---	FHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.000E-01	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6

Site-Specific Parameter Summary (continued)

Menu ☐	Parameter	☐ User	☐ Input	☐ Default	☐ Used by RESRAD (If different from user input)	☐ Parameter Name
R019 ☐	Livestock soil intake (kg/day)	☐ not used	☐	☐ 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	☐ ---	☐ FGWRH
R019 ☐	Livestock water fraction from ground water	☐ 0.000E+00	☐	☐ 1.000E+00	☐ ---	☐ FGWLW
R019 ☐	Irrigation fraction from ground water	☐ not used	☐	☐ 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
C14 ☐	C-12 evasion flux rate from soil (1/sec)	☐ not used	☐	☐ 1.000E-10	☐ ---	☐ REVSIN
C14 ☐	Fraction of grain in beef cattle feed	☐ not used	☐	☐ 8.000E-01	☐ ---	☐ AVFC4
C14 ☐	Fraction of grain in milk cow feed	☐ not used	☐	☐ 2.000E-01	☐ ---	☐ AVFG5
STOR ☐	Storage times of contaminated foodstuffs (days):	☐	☐	☐	☐	☐
STOR ☐	Fruits, non-leafy vegetables, and grain	☐ 1.400E+01	☐	☐ 1.400E+01	☐ ---	☐ STOR_T(1)
STOR ☐	Leafy vegetables	☐ 1.000E+00	☐	☐ 1.000E+00	☐ ---	☐ STOR_T(2)
STOR ☐	Milk	☐ not used	☐	☐ 1.000E+00	☐ ---	☐ STOR_T(3)
STOR ☐	Meat and poultry	☐ not used	☐	☐ 2.000E+01	☐ ---	☐ STOR_T(4)
STOR ☐	Fish	☐ not used	☐	☐ 7.000E+00	☐ ---	☐ STOR_T(5)
STOR ☐	Crustacea and mollusks	☐ not used	☐	☐ 7.000E+00	☐ ---	☐ STOR_T(6)
STOR ☐	Well water	☐ 1.000E+00	☐	☐ 1.000E+00	☐ ---	☐ STOR_T(7)
STOR ☐	Surface water	☐ 1.000E+00	☐	☐ 1.000E+00	☐ ---	☐ STOR_T(8)
STOR ☐	Livestock fodder	☐ not used	☐	☐ 4.500E+01	☐ ---	☐ STOR_T(9)
R021 ☐	Thickness of building foundation (m)	☐ 1.500E-01	☐	☐ 1.500E-01	☐ ---	☐ FLOOR
R021 ☐	Bulk density of building foundation (g/cm**3)	☐ 2.400E+00	☐	☐ 2.400E+00	☐ ---	☐ DENSFL
R021 ☐	Total porosity of the cover material	☐ 4.000E-01	☐	☐ 4.000E-01	☐ ---	☐ TPCV
R021 ☐	Total porosity of the building foundation	☐ 1.000E-01	☐	☐ 1.000E-01	☐ ---	☐ TPFL
R021 ☐	Volumetric water content of the cover material	☐ 5.000E-02	☐	☐ 5.000E-02	☐ ---	☐ PH2OCV
R021 ☐	Volumetric water content of the foundation	☐ 3.000E-02	☐	☐ 3.000E-02	☐ ---	☐ PH2OFL
R021 ☐	Diffusion coefficient for radon gas (m/sec):	☐	☐	☐	☐	☐
R021 ☐	in cover material	☐ 2.000E-06	☐	☐ 2.000E-06	☐ ---	☐ DIFCV
R021 ☐	in foundation material	☐ 3.000E-07	☐	☐ 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)	☐ 6.230E+00	☐	☐ 2.000E+00	☐ ---	☐ WIND
R021 ☐	Average building air exchange rate (1/hr)	☐ 5.000E-01	☐	☐ 5.000E-01	☐ ---	☐ REXG
R021 ☐	Height of the building (room) (m)	☐ 2.500E+00	☐	☐ 2.500E+00	☐ ---	☐ HRM
R021 ☐	Building interior area factor	☐ 0.000E+00	☐	☐ 0.000E+00	☐ code computed (time dependent)	☐ FAI
R021 ☐	Building depth below ground surface (m)	☐ 1.000E+00	☐	☐ -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	☐ 1.500E-01	☐	☐ 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	☐	suppressed
5 -- milk ingestion	☐	suppressed
6 -- aquatic foods	☐	suppressed
7 -- drinking water	☐	active
8 -- soil ingestion	☐	active
9 -- radon	☐	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
*****		*****	
Area:	52000.00 square meters	Am-241	1.000E+00
Thickness:	4.00 meters	Co-60	1.000E+00
Cover Depth:	1.00 meters	Cs-137	1.000E+00
		Eu-152	1.000E+00
		Eu-154	1.000E+00
		Eu-155	1.000E+00
		H-3	1.000E+00
		Pu-238	1.000E+00
		Pu-239	1.000E+00
		Pu-240	1.000E+00
		Ra-226	1.000E+00
		Sr-90	1.000E+00
		U-234	1.000E+00
		U-235	1.000E+00
		U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 75 mrem/yr

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

t (years):	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02
TDOSE(t):	7.098E+01	7.137E+01	7.260E+01	7.370E+01	7.290E+01	7.303E+01	7.157E+01	6.742E+01	6.400E+01
M(t):	9.464E-01	9.516E-01	9.680E-01	9.827E-01	9.719E-01	9.737E-01	9.543E-01	8.990E-01	8.533E-01
Maximum TDOSE(t):	7.373E+01 mrem/yr	at t = 10.11 ± 0.01 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 = 10.11 years
 Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil
*****	*****		*****		*****		*****		*****		*****		*****
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
fract.	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
Am-241	3.249E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Co-60	6.539E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Cs-137	2.695E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Eu-152	2.477E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Eu-154	2.826E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Eu-155	5.768E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Pu-238	1.506E-17	0.0000	0.000E+00	0.0000	1.308E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Pu-239	3.554E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Pu-240	8.236E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Ra-226	8.002E-06	0.0000	0.000E+00	0.0000	7.081E+01	0.9605	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Sr-90	2.238E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
U-234	1.570E-12	0.0000	0.000E+00	0.0000	1.389E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
U-235	6.136E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
U-238	1.992E-08	0.0000	0.000E+00	0.0000	1.315E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00
Total	2.013E-05	0.0000	0.000E+00	0.0000	7.081E+01	0.9605	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00

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	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00		6.464E-25	6.798E-25	8.313E-25	1.069E-24	2.923E-24	7.995E-24	9.887E-23	1.712E-02	2.458E-02	7.993E-02
Am-241	Np-237	1.000E+00		0.000E+00	5.905E-07	1.382E-05	5.342E-05	3.378E-04	5.362E-04	7.587E-04	6.737E-04	4.976E-04	2.336E-04
Am-241	U-233	1.000E+00		0.000E+00	2.379E-14	2.701E-12	2.093E-11	4.512E-10	1.349E-09	4.089E-09	1.010E-08	1.018E-08	5.849E-09
Am-241	Th-229	1.000E+00		0.000E+00	1.152E-16	1.087E-15	2.091E-15	3.637E-14	1.719E-13	9.937E-13	1.591E-11	4.274E-11	9.682E-10
Am-241	ΣDSR(j)			6.464E-25	5.905E-07	1.382E-05	5.342E-05	3.378E-04	<u>5.362E-04</u>	7.587E-04	1.780E-02	2.508E-02	8.017E-02
Co-60	Co-60	1.000E+00		2.204E-05	1.490E-04	3.933E-04	4.002E-04	8.444E-05	<u>9.977E-06</u>	2.681E-08	2.515E-19	1.058E-30	0.000E+00
Cs-137	Cs-137	1.000E+00		2.913E-07	7.175E-06	3.166E-05	5.615E-05	1.057E-04	<u>1.107E-04</u>	6.943E-05	1.558E-05	2.866E-07	1.424E-10
Eu-152	Eu-152	7.208E-01		2.628E-06	2.530E-06	2.171E-06	1.793E-06	8.348E-07	<u>3.886E-07</u>	5.746E-08	4.183E-11	1.397E-14	6.947E-23
Eu-152	Eu-152	2.792E-01		1.018E-06	9.799E-07	8.410E-07	6.946E-07	3.234E-07	1.505E-07	2.226E-08	1.620E-11	5.413E-15	2.691E-23
Eu-152	Gd-152	2.792E-01		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.018E-16	1.965E-16	2.837E-15
Eu-152	ΣDSR(j)			1.018E-06	9.799E-07	8.410E-07	6.946E-07	3.234E-07	1.505E-07	2.226E-08	1.620E-11	5.610E-15	2.837E-15
Eu-154	Eu-154	1.000E+00		5.470E-06	5.124E-06	3.946E-06	2.846E-06	7.706E-07	<u>2.086E-07</u>	7.958E-09	2.639E-14	3.830E-20	2.505E-34
Eu-155	Eu-155	1.000E+00		1.723E-15	1.546E-15	1.003E-15	5.838E-16	6.703E-17	<u>7.697E-18</u>	3.439E-20	1.732E-23	2.434E-35	0.000E+00
H-3	H-3	1.000E+00		0.000E+00	2.210E-02	2.973E-04	1.362E-06	6.077E-16	2.639E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pu-238	Pu-238	1.000E+00		2.160E-19	2.661E-06	1.289E-05	2.478E-05	6.348E-05	9.034E-05	1.217E-04	2.264E-03	8.948E-04	1.072E-04
Pu-238	U-234	1.000E+00		0.000E+00	2.932E-08	7.199E-07	2.815E-06	2.316E-05	5.887E-05	1.424E-04	1.399E-04	6.535E-05	5.299E-06
Pu-238	Th-230	1.000E+00		0.000E+00	2.709E-15	1.543E-13	1.039E-12	2.329E-11	9.838E-11	5.879E-10	4.974E-09	9.225E-09	8.025E-08
Pu-238	Ra-226	1.000E+00		0.000E+00	1.306E-13	1.610E-11	1.267E-10	3.208E-09	1.394E-08	9.553E-08	1.470E-06	4.188E-06	1.390E-05
Pu-238	Pb-210	1.000E+00		0.000E+00	1.733E-15	1.006E-13	8.455E-13	2.730E-11	1.500E-10	1.447E-09	3.668E-08	1.311E-07	5.839E-07
Pu-238	ΣDSR(j)			2.160E-19	2.690E-06	1.361E-05	2.760E-05	8.664E-05	<u>1.492E-04</u>	2.642E-04	2.405E-03	9.645E-04	1.271E-04
Pu-239	Pu-239	1.000E+00		2.840E-14	2.967E-06	1.483E-05	2.966E-05	8.894E-05	1.481E-04	2.958E-04	2.657E-02	5.069E-02	3.098E-01
Pu-239	U-235	1.000E+00		0.000E+00	9.636E-12	2.391E-10	9.471E-10	8.209E-09	2.197E-08	6.301E-08	1.455E-07	1.751E-07	2.599E-07
Pu-239	Pa-231	1.000E+00		0.000E+00	3.178E-16	1.203E-14	8.913E-14	2.216E-12	9.914E-12	6.704E-11	1.104E-09	3.312E-09	1.508E-08
Pu-239	Ac-227	1.000E+00		0.000E+00	3.331E-16	2.519E-15	1.938E-14	8.510E-13	5.462E-12	5.912E-11	1.070E-09	2.924E-09	1.865E-08
Pu-239	ΣDSR(j)			2.840E-14	2.967E-06	1.483E-05	2.966E-05	8.894E-05	<u>1.482E-04</u>	2.959E-04	2.657E-02	5.069E-02	3.098E-01
Pu-240	Pu-240	1.000E+00		5.473E-21	2.967E-06	1.483E-05	2.964E-05	8.873E-05	1.476E-04	2.936E-04	2.596E-02	4.877E-02	2.867E-01
Pu-240	U-236	1.000E+00		0.000E+00	2.918E-10	7.238E-09	2.867E-08	2.484E-07	6.646E-07	1.902E-06	4.348E-06	5.167E-06	5.500E-06
Pu-240	Th-232	1.000E+00		0.000E+00	2.104E-37	7.130E-19	2.022E-18	1.750E-17	2.947E-17	2.431E-16	2.818E-15	7.851E-15	1.400E-13
Pu-240	Ra-228	1.000E+00		0.000E+00	4.717E-26	2.287E-18	6.143E-18	4.666E-17	5.823E-17	6.860E-16	2.258E-14	8.327E-14	1.065E-12
Pu-240	Th-228	1.000E+00		0.000E+00	2.155E-19	1.206E-18	2.748E-18	1.176E-17	2.517E-17	7.658E-17	8.152E-16	3.325E-15	1.207E-12
Pu-240	ΣDSR(j)			5.473E-21	2.967E-06	1.484E-05	2.967E-05	8.898E-05	<u>1.482E-04</u>	2.955E-04	2.596E-02	4.877E-02	2.867E-01
Ra-226	Ra-226	1.000E+00		7.098E+01	7.096E+01	7.090E+01	7.081E+01	7.048E+01	7.015E+01	6.928E+01	6.610E+01	6.270E+01	5.756E+01
Ra-226	Pb-210	1.000E+00		0.000E+00	1.925E-05	4.446E-04	1.613E-03	9.998E-03	1.965E-02	3.732E-02	5.321E-01	9.051E-01	1.594E+00
Ra-226	ΣDSR(j)			7.098E+01	7.096E+01	7.090E+01	7.082E+01	7.049E+01	<u>7.017E+01</u>	6.932E+01	6.663E+01	6.361E+01	5.916E+01

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	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	3.238E-11	3.229E-01	1.403E+00	2.305E+00	7.458E-01	<u>2.460E-01</u>	1.476E-02	2.070E-07	2.833E-12	1.971E-24	
U-234	U-234	1.000E+00	1.951E-18	2.071E-02	1.024E-01	2.019E-01	5.725E-01	9.028E-01	7.694E-01	2.412E-01	7.808E-02	4.607E-03	
U-234	Th-230	1.000E+00	0.000E+00	2.218E-09	2.976E-08	1.055E-07	8.415E-07	2.214E-06	6.248E-06	1.988E-05	2.919E-05	2.289E-04	
U-234	Ra-226	1.000E+00	0.000E+00	1.382E-07	3.430E-06	1.360E-05	1.182E-04	3.172E-04	1.167E-03	7.821E-03	1.695E-02	4.507E-02	
U-234	Pb-210	1.000E+00	0.000E+00	3.676E-10	3.326E-09	1.778E-08	4.985E-07	2.266E-06	1.532E-05	1.945E-04	5.333E-04	1.897E-03	
U-234	ΣDSR(j)		1.951E-18	2.071E-02	1.024E-01	2.019E-01	5.726E-01	<u>9.032E-01</u>	7.706E-01	2.492E-01	9.559E-02	5.181E-02	
U-235	U-235	1.000E+00	5.143E-11	1.954E-02	9.660E-02	1.905E-01	5.401E-01	8.519E-01	7.261E-01	2.277E-01	7.377E-02	5.649E-03	
U-235	Pa-231	1.000E+00	0.000E+00	3.148E-07	6.661E-06	2.582E-05	2.205E-04	5.886E-04	1.685E-03	6.287E-03	9.802E-03	1.867E-02	
U-235	Ac-227	1.000E+00	0.000E+00	4.850E-09	5.626E-07	4.291E-06	9.695E-05	3.809E-04	1.843E-03	7.102E-03	9.564E-03	2.404E-02	
U-235	ΣDSR(j)		5.143E-11	1.954E-02	9.660E-02	1.905E-01	5.405E-01	<u>8.529E-01</u>	7.296E-01	2.411E-01	9.314E-02	4.836E-02	
U-238	U-238	1.000E+00	1.813E-08	1.969E-02	9.732E-02	1.919E-01	5.442E-01	8.583E-01	7.315E-01	2.294E-01	7.433E-02	4.616E-03	
U-238	U-234	1.000E+00	0.000E+00	5.898E-08	1.453E-06	5.727E-06	4.869E-05	1.280E-04	3.182E-04	2.052E-04	1.107E-04	1.307E-05	
U-238	Th-230	1.000E+00	0.000E+00	4.029E-12	1.051E-11	3.877E-11	1.487E-10	4.056E-10	1.112E-09	7.574E-09	1.304E-08	1.104E-07	
U-238	Ra-226	1.000E+00	0.000E+00	1.117E-11	4.299E-11	2.255E-10	3.604E-09	1.516E-08	1.018E-07	1.678E-06	5.044E-06	1.799E-05	
U-238	Pb-210	1.000E+00	0.000E+00	8.423E-11	2.084E-10	8.443E-10	2.728E-09	6.225E-09	1.181E-08	8.256E-08	1.917E-07	8.073E-07	
U-238	ΣDSR(j)		1.813E-08	1.969E-02	9.732E-02	1.919E-01	5.442E-01	<u>8.584E-01</u>	7.317E-01	2.297E-01	7.444E-02	4.648E-03	

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

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
 Basic Radiation Dose Limit = 75 mrem/yr

Nuclide (i)	t=	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	*3.430E+12	1.270E+08	5.428E+06	1.404E+06	2.220E+05	1.399E+05	9.885E+04	4.214E+03	2.990E+03	9.356E+02	
Co-60	3.403E+06	5.035E+05	1.907E+05	1.874E+05	8.882E+05	7.517E+06	2.797E+09	*1.131E+15	*1.131E+15	*1.131E+15	
Cs-137	2.574E+08	1.045E+07	2.369E+06	1.336E+06	7.099E+05	6.776E+05	1.080E+06	4.814E+06	2.617E+08	5.267E+11	
Eu-152	2.057E+07	2.137E+07	2.490E+07	3.015E+07	6.476E+07	1.391E+08	9.407E+08	1.292E+12	*1.765E+14	*1.765E+14	
Eu-154	1.371E+07	1.464E+07	1.901E+07	2.635E+07	9.733E+07	3.595E+08	9.425E+09	*2.639E+14	*2.639E+14	*2.639E+14	
Eu-155	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	
H-3	*9.594E+15	3.393E+03	2.523E+05	5.508E+07	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	
Pu-238	*1.711E+13	2.788E+07	5.510E+06	2.718E+06	8.656E+05	5.026E+05	2.839E+05	3.118E+04	7.776E+04	5.901E+05	
Pu-239	*6.212E+10	2.528E+07	5.056E+06	2.528E+06	8.432E+05	5.062E+05	2.535E+05	2.823E+03	1.480E+03	2.421E+02	
Pu-240	*2.277E+11	2.528E+07	5.056E+06	2.528E+06	8.429E+05	5.060E+05	2.538E+05	2.889E+03	1.538E+03	2.616E+02	
Ra-226	1.057E+00	1.057E+00	1.058E+00	1.059E+00	1.064E+00	1.069E+00	1.082E+00	1.126E+00	1.179E+00	1.268E+00	
Sr-90	2.316E+12	2.323E+02	5.345E+01	3.254E+01	1.006E+02	3.049E+02	5.081E+03	3.623E+08	2.648E+13	*1.365E+14	
U-234	*6.245E+09	3.621E+03	7.325E+02	3.715E+02	1.310E+02	8.304E+01	9.733E+01	3.009E+02	7.846E+02	1.448E+03	
U-235	*2.160E+06	3.838E+03	7.764E+02	3.937E+02	1.388E+02	8.794E+01	1.028E+02	3.110E+02	8.053E+02	1.551E+03	
U-238	*3.360E+05	3.809E+03	7.706E+02	3.908E+02	1.378E+02	8.737E+01	1.025E+02	3.266E+02	1.007E+03	1.614E+04	

*At specific activity limit

Attachment C
Calculation Package for Residual Radioactive Material
under the Basement and 2' Along the Sides

Resident in Basement Short Wall Calculation

Figure 4-14. Rectangular Volume Geometry (Short Wall)

Dose Point
Location Units

X 374
Y 14'
Z 14'

Source Dimension

Height 13'
Width 28'
Length 360'

Quadrature Order

Height _____
Width _____
Length _____

		Shields & Materials					
Shield Number or Name:		# <u>Short Wall</u>	# _____	# _____	# _____	# _____	immers'n
Thickness in units of <u>Feet</u> :		<u>0.75</u>	_____	_____	_____	_____	
√ Buildup Reference:		☒	☐	☐	☐	☐	☒
Material	Density (g/cc)	Densities (Use √ to indicate default value or enter a partial or alternate density)					
Air	0.00122	_____	_____	_____	_____	_____	<u>0.00122</u>
Tin	7.3	_____	_____	_____	_____	_____	_____
Aluminum	2.702	_____	_____	_____	_____	_____	_____
Titanium	4.5	_____	_____	_____	_____	_____	_____
Concrete	2.35	_____	_____	_____	_____	_____	_____
Tungsten	19.3	_____	_____	_____	_____	_____	_____
Iron	7.86	_____	_____	_____	_____	_____	_____
Uranium	18.75	_____	_____	_____	_____	_____	_____
Lead	11.3	_____	_____	_____	_____	_____	_____
Water	1.0	_____	_____	_____	_____	_____	_____
Nickel	8.9	_____	_____	_____	_____	_____	_____
Zirconium	6.5	_____	_____	_____	_____	_____	_____
<u>RNL Soil</u>	<u>1.67</u>	<u>1.67</u>	_____	_____	_____	_____	_____

Page : 1 of 3
 DOS File: OU4CSSW.MS4
 Run Date: December 4, 1996
 Run Time: 11:51 a.m. Wednesday
 Duration: 0:01:55

File Ref: MS4/DER/OU4
 Date: 12/4/96
 By: R J D...
 Checked: _____

Case Title: Inadvertent Future Intruder w OU I Soil: Basement (Short)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet and inches	
Dose point coordinate X:	11399.52	374.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	426.72	14.0	.0
Rectangular volume width :	853.44	28.0	.0
Rectangular volume length:	10972.8	359.0	12.0
Rectangular volume height:	396.24	13.0	.0
Shield 1:	22.86	0.0	9.0
Air Gap:	403.86	13.0	3.0

Source Volume: 3.71064e+9 cm³ 131040. cu ft. 226437120 cu in.

MATERIAL DENSITIES (g/cm³)

Material	Source Shield	Shield 1 Slab	Air Gap	Immersion Shield
Air			0.00122	0.00122
Concrete		2.35		
BNL Soil	1.67			

BUILDUP

Method: Buildup Factor Tables
 The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$	Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$
Ba-137m	5.8621e-003	1.5798e-006	Cs-137	6.1968e-003	<u>1.6700e-006</u>

Page : 2 of 3
 DOS File: OU4CSSW.MS4
 Run Date: December 4, 1996
 Run Time: 11:51 a.m. Wednesday
 Title : Inadvertent Future Intruder w OU I² Soil: Basement (Short)

===== RESULTS =====					
Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	4.490e+006	4.538e-039	1.293e-028	3.780e-041	1.077e-030
0.0322	8.285e+006	7.123e-038	2.554e-028	5.732e-040	2.056e-030
0.0364	3.015e+006	2.423e-030	2.390e-028	1.377e-032	1.358e-030
0.6616	1.952e+008	1.058e-005	3.385e-004	2.051e-008	6.563e-007
TOTAL:	2.110e+008	1.058e-005	3.385e-004	2.051e-008	6.563e-007

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE

FILE: OU4CSSW.MS4

Case Title: Inadvertent Future Intruder w OU I. Soil: Basement (Short)

This case was run on Wednesday, December 4, 1996 at 11:51 a.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm ² /sec	1.599e-005	5.117e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	1.058e-005	3.385e-004
Exposure Rate in Air	mR/hr	2.051e-008	6.563e-007
Absorbed Dose Rate in Air	mGy/hr	1.791e-010	5.730e-009
"	mrads/hr	1.791e-008	5.730e-007
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	2.120e-010	6.784e-009
o Opposed "	"	1.698e-010	5.431e-009
o Rotational "	"	1.698e-010	5.431e-009
o Isotropic "	"	1.501e-010	4.803e-009
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	2.253e-010	7.210e-009
o Opposed "	"	2.140e-010	6.848e-009
o Rotational "	"	2.140e-010	6.848e-009
o Isotropic "	"	1.605e-010	5.134e-009
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.875e-010	5.998e-009
o Posterior/Anterior "	"	1.655e-010	5.294e-009
o Lateral "	"	1.227e-010	3.926e-009
o Rotational "	"	1.479e-010	4.731e-009 ←
o Isotropic "	"	1.259e-010	4.028e-009

Resident in Basement Long Wall Calculation

Figure 4-14. Rectangular Volume Geometry (Long Wall)

Dose Point

Location Units

X 374'

Y 14'

Z 19'

Source Dimension

Height 13'

Width 38'

Length 355'

Quadrature Order

Height

Width

Length

Shields & Materials

Shield Number or Name:

Long Wall

#

#

#

#

immers'n

Thickness in units of Feet:

0.75

#

#

#

#

√ Buildup Reference:

☒☐☐☐☐☒

Material

Density

(g/cc)

Air

0.00122

Tin

7.3

Aluminum

2.702

Titanium

4.5

Concrete

2.35

Tungsten

19.3

Iron

7.86

Uranium

18.75

Lead

11.3

Water

1.0

Nickel

8.9

Zirconium

6.5

BNL Sol.

1.67

1.67

Densities (Use √ to indicate default value
or enter a partial or alternate density)

0.00122

Page : 1 of 3
 DOS File: OU4CSLW.MS4
 Run Date: December 4, 1996
 Run Time: 12:52 p.m. Wednesday
 Duration: 0:01:55

File Ref: MS4/0ER/0U1
 Date: 12/4/96
 By: B. J. Irvine
 Checked: _____

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Long)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet	and inches
Dose point coordinate X:	11399.52	374.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	579.12	19.0	.0
Rectangular volume width :	1158.24	38.0	.0
Rectangular volume length:	10820.4	355.0	.0
Rectangular volume height:	396.24	13.0	.0
Shield 1:	22.86	0.0	9.0
Air Gap:	556.26	18.0	3.0

Source Volume: 4.96593e+9 cm³ 175370. cu ft. 303039360 cu in.

MATERIAL DENSITIES (g/cm³)

Material	Source Shield	Shield 1 Slab	Air Gap	Immersion Shield
Air			0.00122	0.00122
Concrete		2.35		
BNL Soil	1.67			

BUILDUP

Method: Buildup Factor Tables
 The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$	Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$
Ba-137m	7.8453e-003	1.5798e-006	Cs-137	8.2931e-003	<u>1.6700e-006</u>

Page : 2 of 3
 DOS File: OU4CSLW.MS4
 Run Date: December 4, 1996
 Run Time: 12:52 p.m. Wednesday
 Title : Inadvertent Future Intruder w OU I, Soil Basement (Long)

===== RESULTS =====					
Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	6.010e+006	3.419e-042	1.317e-028	2.848e-044	1.097e-030
0.0322	1.109e+007	6.425e-041	2.602e-028	5.171e-043	2.094e-030
0.0364	4.035e+006	1.019e-032	2.066e-028	5.792e-035	1.174e-030
0.6616	2.612e+008	8.751e-006	2.997e-004	1.696e-008	5.811e-007
TOTAL:	2.823e+008	8.751e-006	2.997e-004	1.696e-008	5.811e-007

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE

FILE: OU4CSLW.MS4

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Long)

This case was run on Wednesday, December 4, 1996 at 12:52 p.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm ² /sec	1.323e-005	4.530e-004
Photon Energy Fluence Rate	MeV/cm ² /sec	8.751e-006	2.997e-004
Exposure Rate in Air	mR/hr	1.696e-008	5.811e-007
Absorbed Dose Rate in Air	mGy/hr	1.481e-010	5.073e-009
"	mrads/hr	1.481e-008	5.073e-007
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.753e-010	6.006e-009
o Opposed "	"	1.404e-010	4.809e-009
o Rotational "	"	1.404e-010	4.809e-009
o Isotropic "	"	1.241e-010	4.252e-009
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.864e-010	6.384e-009
o Opposed "	"	1.770e-010	6.063e-009
o Rotational "	"	1.770e-010	6.063e-009
o Isotropic "	"	1.327e-010	4.546e-009
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.550e-010	5.311e-009
o Posterior/Anterior "	"	1.369e-010	4.688e-009
o Lateral "	"	1.015e-010	3.476e-009
o Rotational "	"	1.223e-010	4.189e-009 ←
o Isotropic "	"	1.041e-010	3.566e-009

Resident in Basement Floor Calculation

Figure 4-14. Rectangular Volume Geometry (Floor)

Dose Point
Location Units

X 14'
Y 14'
Z 19'

Source Dimension

Height 28'
Width 38'
Length 10.25'

Quadrature Order

Height _____
Width _____
Length _____

		Shields & Materials					
Shield Number or Name:		# Floor	#	#	#	#	immers'n
Thickness in units of <u>feet</u> :		0.33					
√ Buildup Reference:		☒	☐	☐	☐	☐	☐
Material	Density (g/cc)						
Air	0.00122						
Tin	7.3						
Aluminum	2.702						
Titanium	4.5						
Concrete	2.35						
Tungsten	19.3						
Iron	7.86						
Uranium	18.75						
Lead	11.3						
Water	1.0						
Nickel	8.9						
Zirconium	6.5						
BNL Soil	1.67	1.67					

Densities (Use √ to indicate default value or enter a partial or alternate density)

Page : 1 of 3
 DOS File: OU4CSFL.MS4
 Run Date: December 4, 1996
 Run Time: 2:01 p.m. Wednesday
 Duration: 0:01:49

File Ref: MS4/OEA/OUT
 Date: 12/4/96
 By: B J Draine
 Checked: _____

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Floor)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet	and inches
Dose point coordinate X:	426.72	14.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	579.12	19.0	.0
Rectangular volume width :	1158.24	38.0	.0
Rectangular volume length:	312.42	10.0	3.0
Rectangular volume height:	853.44	28.0	.0
Shield 1:	10.0584	0.0	4.0
Air Gap:	104.2416	3.0	5.0

Source Volume: 3.08824e+8 cm³ 10906 cu ft. 18845568 cu in.

MATERIAL DENSITIES (g/cm³)

Material	Source Shield	Shield 1 Slab	Air Gap
Air			0.00122
Concrete		2.35	
BNL Soil	1.67		

BUILDUP

Method: Buildup Factor Tables
 The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$	Nuclide	curies	$\mu\text{Ci}/\text{cm}^3$
Ba-137m	4.8789e-004	1.5798e-006	Cs-137	5.1574e-004	<u>1.6700e-006</u>

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 Run Time: 2:01 p.m. Wednesday
 Title : Inadvertent Future Intruder w OU I' Soil Basement (Floor)

===== RESULTS =====					
Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	3.737e+005	5.518e-017	3.193e-016	4.596e-019	2.660e-018
0.0322	6.895e+005	2.172e-016	1.293e-015	1.748e-018	1.041e-017
0.0364	2.509e+005	5.579e-014	4.516e-013	3.170e-016	2.566e-015
0.6616	1.624e+007	6.163e-003	4.716e-002	1.195e-005	9.142e-005
TOTAL:	1.756e+007	6.163e-003	4.716e-002	1.195e-005	9.142e-005

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE

FILE: OU4CSFL.MS4

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Floor)

This case was run on Wednesday, December 4, 1996 at 2:01 p.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
-----	-----	-----	-----
Photon Fluence Rate (flux)	Photons/cm ² /sec	9.315e-003	7.127e-002
Photon Energy Fluence Rate	MeV/cm ² /sec	6.163e-003	4.716e-002
Exposure Rate in Air	mR/hr	1.195e-005	9.142e-005
Absorbed Dose Rate in Air	mGy/hr	1.043e-007	7.981e-007
"	mrad/hr	1.043e-005	7.981e-005
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.235e-007	9.449e-007
o Opposed "	"	9.888e-008	7.565e-007
o Rotational "	"	9.888e-008	7.565e-007
o Isotropic "	"	8.744e-008	6.690e-007
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.313e-007	1.004e-006
o Opposed "	"	1.247e-007	9.538e-007
o Rotational "	"	1.247e-007	9.538e-007
o Isotropic "	"	9.347e-008	7.151e-007
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.092e-007	8.355e-007
o Posterior/Anterior "	"	9.639e-008	7.375e-007
o Lateral "	"	7.148e-008	5.469e-007
o Rotational "	"	8.614e-008	6.590e-007
o Isotropic "	"	7.333e-008	5.610e-007

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Spreadsheet
for OU I Hot Spot Calculation:
Summation of
Dose to Source Ratios
for
the Two Short and Two Long Walls
and the Basement Floor

HWMF Summation of Dose to Source Ratios for Basement Walls and Floors

BNL Operable Unit 1: AOC 1	Loss of Active Controls Scenario					Ffe: C: OUIHSPOT.wb1
	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate Basement (mrem/hr per pCi/g)	Annual Effective Dose Equivalent Rate Basement (mrem/yr per pCi/g)	Annual Effective Dose Equivalent Rate Basement @ T=50 yrs. (mrem/yr per pCi/g)
Nuclide	Short Wall	Long Wall	Floor			
Cs-137	4.73E-07	4.19E-07	6.59E-05	6.77E-05	2.37E-01	7.51E-02
Am-241	1.24E-15	1.60E-16	1.05E-10	1.05E-10	3.66E-07	3.38E-07

Attachment D
Spreadsheet for Failure of Institutional Controls:
Dose to Source Ratios for OU I Soils
&
Topsoil and Buried Soils Concentrations
to Obtain 75 mrem/yr

HWMF Loss of Active Control Scenario: Dose to Source Ratios and Concentrations for 75 mrem/yr

HWMF Loss of Active Controls Scenario - Dose to Source Ratios and Concentrations			Resident (Adjusted for - Basement Occupancy) 6" Topsoil	Resident (Adjusted for -40% Dilution & Basement Occupancy) 6" Topsoil	Resident Soil Below 3" Cover	Basement Resident Annual Effective Dose	Resident Total Corrected	OUI Soil Buried under 3" cover	40% Diluted Soil	75 rem/yr mix	File: HMAFact.mdb1
Radionuclide	Vol. Weighted Avg. Conc. (pCi/g)	Concentration Ratio OUI IV Rad. Soil Mixture	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Equivalent Rate @ 50 yrs (mrem/yr per pCi/g)	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Conc. for 75 mrem/yr (pCi/g)	Conc. for 75 mrem/yr (pCi/g)	Dose per Nuclide (mrem/yr)	Soil Burial Cutoff Level 75 mrem/yr @ 50 yrs (pCi/g)
Sr-90	4.09E+01	2.77E-03	7.99E-08	3.20E-08	2.46E-01	0.00E+00	2.46E-01	2.29E+00	9.00E-01	6.63E-01	3.05E+02
Cs-137	1.47E+04	9.97E-01	1.08E-01	7.93E-02	1.11E-04	7.81E-02	1.81E-01	4.95E+02	1.98E+02	7.45E+01	4.98E+02
U-235	2.60E-01	1.90E-05	7.10E-04	2.04E-04	9.33E-01	0.00E+00	9.33E-01	6.34E-02	2.14E-02	4.66E-02	8.79E+01
Am-241	4.60E+00	3.05E-04	1.93E-01	7.72E-02	6.36E-04	3.38E-07	7.72E-02	7.82E-02	3.13E-02	6.09E-03	9.69E+02
Total Soil Conc	14755	1.00					1			75	

Appendix J

Hazardous Waste Management Facility (HWMF): RADS Net-Benefit Analysis Worksheets and Excavation/Disposal Cost Spreadsheets

Hazardous Waste Management Facility
(HWMF):
RADS Net-Benefit Analysis
Worksheets

NET-BENEFIT ANALYSIS WORKSHEETS

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ALARA Protective Measure Analysis - Flow Chart

ATTACHMENT 1. RADIOLOGICAL PROBLEM DEFINITION WORKSHEET

A1. Describe the facility, its present radiological conditions, and the radiological activity of concern.

From 1947 to 1997, the HWMF, released radioactive material to the environment through accidental spills and overflows of radioactive waste, runoff from activated/contaminated equipment and from leaking waste containers, as well as, local radioactive fallout. As a result of these past operations, the soil was contaminated with long-lived mixed fission and activation products (see Appendix C for contaminated soil volumes and radionuclide concentrations). Dose rates at 1 meter above the ground are as high as 6 mR/hr. Under the excavation and off-site disposal alternative all contaminated soil above the various risk based soil cleanup guidelines will be excavated and disposed of at off-site low-level waste facilities. The area has been fenced to prevent access to the radiological area. The area was assumed to be under institutional control for 50 more years. The future use for the area was assumed to be undeveloped open-space.

A2. Describe the proposed ALARA protective measure (APM).

The remedial alternative to be evaluated against the no action alternative was the large scale excavation of the volumes of soil containing predominately Cs 137 and Sr 90 shown in Appendix C. The soil that was above 2,800 pCi/g was stabilized by mixing it with Portland cement and poring it into a B-25 steel container. The remaining contaminated soil was loaded into approved packages(B-25 steel containers) that were then were then safely stored at an on-site low-level waste storage facility. Subsequently, the low level soil was transported by truck to the Envirocare TSD facility located in Givens, Utah(waste concentrations from 67 pCi/g to 2,800 pCi/g) and the stabilized waste by sole-source vehicle to Fluro Daniels - Hanford in Richland, Washington(waste concentrations greater than 2,800 pCi/g) for off-site disposal. The relevant time frame for estimating cost elements and radiation exposure was 270 years. The property was assumed to be under the institutional control of BNL until 2047. From 2047 to 2317, the property was assumed to be undeveloped open space and was assumed to have 30 visitors annually to the former HWMF site.

A3. Determine the relevant time frame for estimating the cost elements and exposure impact.

The relevant time frame for estimating cost elements and radiation exposure was 270 years. The property will be under the Federal control of the DOE until 2047 during which routine monitoring of wells and security/safety inspections will continue. From 2047 to 2317 the property will be assumed to be occupied .by visitors to this undeveloped open-space.

A4. Identify the cost savings associated with the implementation of the APM, e.g., maintenance labor, operation labor, inspection labor, production, processing, salvage, reduced chemicals, reduced consumables, and reduced radwaste.

There were two main expected cost-savings resulting from removing the radioactive soil. The first was the sampling of three wells may not have to be performed after 5 years following remediation. If remediation occurs in 1999, and after 5 years, radiochemical analysis results indicate that groundwater levels are low and decreasing, post-closure monitoring could be terminated; there would be no monitoring for the 43 remaining years of federal control and the 30 year NYS required post-closure monitoring. Monitoring and reporting for three wells at \$ 1,000 per well per year for 73 years; saves \$ 219,000. The second main savings would be the potential real-estate proceeds from the sale of the property to the Pine Barren Preserve Association or Suffolk County. In this area of the Brookhaven township, real estate is selling for approximately \$ 50,000 per acre (Newsday, 1996). It was assumed that if no remedial action was taken that no person or entity would purchase the contaminated property. The 12-acres HWMF site land could have a post-remediation value or savings of \$ 600,000.

- A5. Identify the cost elements for implementation of the APM, e.g., design and engineering, equipment procurement, fabrication, installation or construction labor, operation, maintenance, associated training and procedure, additional chemicals, additional consumables, special tools, additional radwaste, as well as the costs to decontaminate decommission, dispose of and restore the environment during facility/system closure.

The estimated capital cost plus the present(1997) worth of operating and maintenance expenses for excavation and off-site disposal was \$64,728,029 to cleanup to the 1 mrem/yr risk-based remediation goal, \$28,650,610 to 15 mrem/yr, \$24,826,661 to 25 mrem/yr, \$17,102,971 to 75 mrem/yr, and \$16,420,861 to the 100 mrem/yr limit. Periodic operating and maintenance expenses were included in this total and were converted to present worth in 1997 dollars using a 3.0% discount rate(USDOE 1996). The present worth for long term radiological environmental and ecological monitoring programs/reports, the CERCLA/RCRA post closure monitoring program/reports, and HWMF site maintenance and security inspections was \$457,641.

- A6. Estimate the collective dose without the protective measure, with the protective measure, to implement the protective measure, and to decommission and restore the environment during facility/system closure. Determine, if possible, the maximum individual dose for the present or existing radiological activity.

The dose to the present BNL workers to sample at the three monitoring wells and for grounds security/safety inspections at the HWMF were estimated to be about 4.34 person-rem with no environmental remediation i.e., existing radiological conditions. The collective doses to sample at the monitoring wells and grounds security/safety inspections (0.018 person-rem) following the remedial actions were estimated to be 0.245 person-rem at 1 mrem/yr cleanup goal, 0.285 person-rem at 15 mrem/yr, 0.328 person-rem at 25 mrem/yr, 0.456 person-rem at 75 mrem/yr and 0.525 person-rem at the 100 mrem/yr dose limit. The collective doses to workers from excavation, transport, and temporary storage of the contaminated soil from the HWMF were estimated using the volume-weighted arithmetic average concentrations. These upper-limit dose assessments, show that: 203 person-rem would be received at 1 mrem/yr risk based cleanup goal; 199 person-rem at 15 mrem/yr; 199 person-rem at 25 mrem/yr, 195 person-rem at 75 mrem/yr, and 194 person-rem at the 100 mrem/yr dose limit. The collective dose impacts to drivers/workers from waste handling, transporting and disposing was 19.6 person-rem at 1 mrem/yr risk based cleanup goal; 19.2 person-rem at 15 mrem/yr; 19.1 person-rem at 25 mrem/yr; 18.4 person-rem at 75 mrem/yr, and 18.3 person-rem at the 100 mrem/yr dose limit. It was assumed that the value of the radiation detriment avoided was \$2,000 per person-rem for workers.

The collective dose to 30 visitors to this open space over this 270 year future use period associated with existing radiological conditions i.e., without remediation, was estimated to be 8.55 person rem. The 270 year collective doses to the future visitors who frequent the former HWMF site were estimated to be 0.004 at the 1 mrem/yr risk based cleanup goal, 0.060 at 15 mrem/yr, 0.100 at 25 mrem/yr, 0.302 at 75 mrem/yr, and 0.402 person-rem at the 100 mrem/yr limit. Population doses resulting from site remediation, expressed in terms of collective dose for the first year of exposure following the excavation were 6.20 E-04 person-rem for cleanup to 1 mrem/yr risk based cleanup goal, 4.68 E-04 person-rem for the 15 mrem/yr, 4.70 E-04 person-rem for the 25 mrem/yr, 4.56 E-04 person-rem for the 75 mrem/yr, and 4.54 E-04 person-rem for the 100 mrem/yr limit. The collective dose impact to the public resulting from off-site transporting and disposing was 6.68 person-rem at 1 mrem/yr risk based cleanup goal; 6.54 person-rem at 15 mrem/yr; 6.50 person-rem at 25 mrem/yr, 6.31 person-rem at 75 mrem/yr and 6.28 person-rem at 100 mrem/yr dose limit. It was assumed that the value of the radiation detriment avoided was \$2,000 per person-rem for the public.

- A7. Estimate the potential value of the risks and damages to be avoided as a result of the protection measure; e.g., injury and death to workers excluding radiation, environmental damage, public/worker concerns, litigation costs and civil penalties, facility shutdown, etc. Determine, if possible, or estimate the probability of these damages occurring.

The value of these risks and damages from no action must be subtracted from the value of the risks and damages that may be caused by the remedial action. These included the 1) damages to wildlife habitat, 2) loss of future sale of real property, 3) accidental injury to worker during excavation, packaging and storage; 4) accidental deaths resulting from the transportation of waste to Envirocare and to Hanford; and 5) public concern associated with the transport of the waste to Envirocare and to Hanford.

The following risks and damages were expected if no remedial action and if remedial actions occurred:

- 1) Wetland contamination and prevention of use by wildlife: probability 1.0 and a value of \$5,000 (with no action);
- 2) Worker and public concern for no remedial action: probability of 0.9 and an estimated value of \$120,000 (with no action);
- 3) Accidental injury to remediation workers was estimated using a value of 4.2×10^{-8} fatal injuries per hour of work (NRC 1994). Multiplying the various volumes by 1.62 hrs./m³ (NRC 1994) translated to 59,862 m³ x 1.62 hrs./m³ = 96,980 hrs or 0.004 fatalities, 31,895 hrs or 0.001 fatalities, 25,020 hrs or 0.001 fatalities, 11,136 hrs or 0.0005 fatalities, and 9,910 hrs or 0.0004 fatalities. This yields at \$ 4 M per life: \$16,300, \$5,360, \$4,200, \$2,000 and \$ 1,600 for the 1, 15, 25, 75 mrem/yr remediation goals and the 100 mrem/yr limit ,respectively (with remedial action);
- 4) Accidental injury to the workers and public from the transporting the contaminated soil to Envirocare and Hanford was estimated using a value of 4×10^{-9} occupant deaths per vehicle mile (USDOT 1991). This was multiplied by the total mileage to transport the various volumes of contaminated soil, namely 14,925,758 miles or 0.06 fatalities, 5,097,148 miles or 0.02 fatalities, 4,057,713 miles or 0.016 fatalities, 1,958,638 miles or 0.008 fatalities, and 1,774,548 miles or 0.007 fatalities. This yields, at \$ 4 M per life, \$240,000, \$80,000, \$64,000, 32,000 and \$28,000 for the 1, 15, 25, 75 mrem/yr remediation goals and the 100 mrem/yr limit ,respectively (with remedial action).

ATTACHMENT 2. OVERRIDING FACTOR ANALYSIS WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Overriding Factors	Check One:		
	If APM Implemented	If APM Not Implemented	Neither
B1. Will a violation of a DOE order, federal regulation, or state law occur?		X	
B2. Will significant quantities of radioactive materials be added to the site?			X
B3. Will a violation of a collective bargaining agreement occur?			X
B4. Will the worker administrative dose control level(s) be exceeded?			X
B5. Will a safety-related activity not be completed because of the unavailability of a specially trained, skilled, or certified worker?			X
B6. Other factor(s) (please describe).			None
B7. Other factor(s) (please describe).			None
B8. Conclusion (Explain how answers are overriding factors).		Overriding factors for this remedial alternative due to EPA's CERCLA rule.	
B9. Discussion (basis and references)			OU I Feasibility Study (CDM, 1996)

ATTACHMENT 3. APM BENEFIT CALCULATION WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Task	Quantity	Unit Cost	Cost	Item(s)
C1. <u>Maintenance Labor</u> Enter the total estimated labor savings for the protective measure. Obtain the estimated total maintenance hours saved. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for items C1.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C1
C2. <u>Operations/Production Labor</u> Enter the total estimated operation/production labor savings for the protective measure. Obtain the estimated total operation hours saved. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for items C2.	<u>72 years</u> _____ _____	<u>\$3,000</u> _____ _____	<u>\$219,000</u> 3 MWs _____ _____	C2
C3. <u>Inspection/Surveillance Labor</u> Enter the total estimated inspection/surveillance labor savings for the protective measure. Obtain the estimated total inspection hours saved. Obtain the appropriate dollar/hour rate for inspection from the Cost Control Group. Enter the product(s) on line(s) for items C3.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C3
C4. <u>Efficiency and/or Reliability Savings</u> Enter the total estimated savings associated with production or processing improvements provided by the protective measure. Enter the dollar amount of these savings on line(s) for items C4.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C4
C5. <u>Miscellaneous Savings</u> Enter estimated savings from miscellaneous items (e.g., salvage value of old equipment, reduced chemical and consumable materials, reduced radwaste). Enter the dollar amount of these savings on line(s) for items C5.	<u>12 acres</u> _____ _____	<u>\$ 50,000</u> _____ _____	<u>\$600,000</u> real estate _____ _____	C5

TOTAL ECONOMIC BENEFITS

Enter the total estimated benefits of the protective measure. Add all savings from lines for items C1 through C5, and enter total into Box C.

Grand Total →

\$819,000

Box C

ATTACHMENT 4. APM COST CALCULATION WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Task	Quantity	Unit Cost	Cost	Item(s)
D1. <u>Design and Engineering</u> Enter the total estimated design engineering cost for the protective measure. Obtain the estimated hours to design and engineer the protective measure. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for item(s) D1.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D1
D2. <u>Capital Equipment, Fabrication, Material</u> Enter the total estimated capital costs of equipment, fabrication, and materials for the new technique. Include "up front" hidden costs such as R&D, certification, patent rights, auxiliary construction facilities, etc. Enter product(s) on line(s) for item(s) D2.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D2
D3. <u>Installation and Construction</u> Enter the total estimated labor costs to install the protective measure including start up, testing, and operational readiness reviews. Obtain the estimated total hours of facility and contractor personnel to install and test. Obtain the appropriate dollar/hour rate for facility and contractor labor. Enter the product(s) on line(s) for item(s) D3.	_____ _____ _____	_____ _____ _____	<u>\$28,650,610</u> _____ _____	D3
D4. <u>Implementation: Procedure, Training, Administrative Costs</u> Enter the estimated costs for training, procedure development, and additional administrative and technical services associated with the protective measure (additional O&M being a negative savings obtained in lines C1, C2, and C3 above from the difference between the existing and the protective technique costs for operations, maintenance, and inspection). Enter the product(s) on line(s) for item(s) D4.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D4
D5. <u>Operation and Maintenance</u> Enter the total estimated costs to operate and maintain the protective measure. Obtain the estimated hours to maintain and operate. Obtain the appropriate dollar/hour rate for each work group. Enter the product(s) on line(s) for item(s) D5.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D5
D6. <u>Miscellaneous Costs</u> Enter the estimated total costs for miscellaneous items, e.g., chemicals, consumable materials, special tools, additional radwaste. Enter the product(s) on line(s) for item(s) D6.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D6

Task	Quantity	Unit Cost	Cost	Item(s)
D7. <u>Decontamination, Decommissioning, Disposal and Environmental Restoration Costs</u> Enter the total estimated costs associated with the D&D, disposal, and environmental restoration of the protective measure during facility/system closure. Obtain estimated labor and materials cost to decontaminate, decommissioning, dispose of, and restore the environment during closure. Enter the product(s) on line(s) for item(s) D7.	 	 	 	D7

TOTAL ECONOMIC COST

Enter the total estimated costs of the protective measure. Add all the costs from lines for items D1 through D7 and enter the Grand Total - total into Box D.

\$28,650,610

Box D

ATTACHMENT 5. ESTIMATED RADIATION DOSES TO BE AVOIDED
For the 15 mrem/year Risk-based Remediation Goal

Description of Radiological Activity	Number Exposed	Exp. Hours	Average Dose Rate (mrem/hr)	Collective Dose (Person-Rem)	Item(s)
<p>E1. Dose to workers from existing or present radiological activity</p> <p>Enter the existing number of workers and person-hours to perform activity, e.g., maintenance, operate, inspect, process, or produce. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E1.</p>					
<p><u>Present sampling of monitoring wells before</u></p> <p>_____</p> <p>_____</p>	_____	_____	_____	<u>4.34</u>	E1
	_____	_____	_____	_____	
	_____	_____	_____	_____	
<p>E2. Dose to workers to perform radiological activity with APM implemented</p> <p>Enter the expected number of workers and person-hours with the protective measure to perform activity, e.g., maintenance, operation, inspection, processing, and production. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E2:</p>					
<p><u>Present sampling of monitoring wells after</u></p> <p>_____</p> <p>_____</p>	_____	_____	_____	<u>0.285</u>	E2
	_____	_____	_____	_____	
	_____	_____	_____	_____	
<p>E3. Dose to workers to install and implement APM</p> <p>Enter the number of workers and person-hours to install APM. Enter the total estimated dose to implement or install the protective measure which will result from it, i.e., negative result from the person-rem to operate, maintain, inspect old technique minus person-rem to operate, inspect new technique. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E3.</p>					
<p><u>None</u></p> <p>_____</p> <p>_____</p>	_____	_____	_____	<u>0</u>	E3
	_____	_____	_____	_____	
	_____	_____	_____	_____	
<p>E4. Dose to workers from decommissioning/restoration of APM during closure</p> <p>Enter the number of workers and person-hours to decommission the APM/restore the environment during facility/system closure. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E4.</p>					
<p><u>Excavation, Packaging & On-site Storage</u></p> <p><u>Off-Site Transport, Handling & Disposal</u></p> <p>_____</p>	_____	_____	_____	<u>199</u>	E4
	_____	_____	_____	<u>19.2</u>	
	_____	_____	_____	_____	

ATTACHMENT 5. ESTIMATED RADIATION DOSE TO BE AVOIDED (Cont.)

For the 15 mrem/year Risk-based Remediation Goal

Task	Location (sector)	Number Exposed	Maximum Individual Dose (mrem)	Average Dose/Person (mrem)	Collective Dose (Person- rem)	Item
E5. Dose to public from existing or present radiological activity	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Visitors to Open Space Before Cleanup					8.550	E5
E6. Dose to public from radiological activity with APM implemented	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Visitors After Cleanup to 15 mrem/yr					0.060	E6
E7. Dose to public from decommissioning/restoration of APM during closure	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Impact to Public from Excavation					.000468	E7
Impact to Public Transport /Disposal					6.54	

TOTAL WORKER DOSE AVOIDED

$$E_1 - E_2 - E_3 - E_4 =$$

-214

Box E'

TOTAL PUBLIC DOSE AVOIDED

$$E_5 - E_6 - E_7 =$$

1.95

Box E''

ATTACHMENT 6. ESTIMATED VALUE OF AVOIDED RISKS AND DAMAGES
For the 15 mrem/year Risk-based Remediation Goal

Task	Prob.	Value of Damages	Product	Item(s)
<p>F1. <u>Estimated Value of Potential Injury or Deaths to Workers Avoided</u></p> <p>Enter the probability of an injury or death occurring. Enter the estimated value of potential injury or deaths to workers avoided from other risks (i.e., toxic chemicals, industrial hazards, fire, etc.). Enter the product(s) on line(s) for item F1.</p>	1.0	\$5,360 Worker Injury	-\$5,360	F1
	1.0	\$80,000 Transport Accidents	-\$80,000	
<p>F2. <u>Estimated Value of Potential Damages to the Environment to be Avoided</u></p> <p>Enter the probability of damages occurring to the environment. Enter estimated value of potential damages to the environment to be avoided (i.e., endangered species, national monument, wetland contamination, land contamination, odors, etc.). Enter the product(s) on line(s) for item F2.</p>	1.0	\$5,000 endangered species habitat	\$5,000	F2
<p>F3. <u>Estimated Value of Potential Public/Worker Concerns to be Avoided.</u></p> <p>Enter the probability of public or worker concerns occurring. Enter the estimated value of potential public/worker concerns (i.e., press releases, news releases, public hearings, union negotiations, employee morale, etc.) and associated corrective actions to be avoided. Enter the product(s) on line(s) for item F3.</p>	0.9	\$120,000 public/worker concern	\$108,000	F3
<p>F4. <u>Estimated Value of Impacts Associated with Noncompliance to be Avoided</u></p> <p>Enter the probability of a violation or civil penalty being levied. Enter the estimated value of impacts associated with noncompliance with federal, state, or local laws and rules (i.e., fines, civil penalties, legal expenses, cost of corrective actions, regulatory curtailment of programs, etc.) to be avoided. Enter the product(s) on line(s) for item F4.</p>		Civil Liability, NYS Fine(s) & Legal Costs	?	F4
<p>F5. <u>Estimated Damages Associated with Shutdown to be Avoided</u></p> <p>Enter the probability of a facility shutdown or severe impact to the facility mission occurring. Enter the estimated value for the damages associated with shutdown of a facility program or its operation and its impact on long term facility mission objectives that could be avoided. Enter the product(s) on line(s) for item F5.</p>			\$0	F5
<p>F6. <u>Other Risks/Damages to be Avoided</u></p>			\$0	F6

ESTIMATED VALUE OF AVOIDED RISKS AND DAMAGES

F1+ ...+ F6 =

\$27,640

Box F

ATTACHMENT 7. NET BENEFIT EVALUATION WORKSHEET

For the 15 mrem/year Risk-based Remediation Goal

Cost/Benefit	Dollars	Item(s)
G1. <u>Estimated Economic Benefits</u> Enter the results from Box C on line for item G1.	<u>\$819,000</u>	G1
G2. <u>Estimated Economic Costs</u> Enter the results from Box D on line for item G2.	<u>\$28,650,610</u>	G2
G3 <u>Net Economic Benefit (Costs)</u> Estimated benefit on line for item G1 minus estimated cost on line for item G2. Enter (G1) - (G2) on line G3.	<u>-\$27,831,610</u>	G3

Value of Net Dose Savings	Person-Rem	Dollars/ Person-Rem	Dollars	Item(s)
G4. <u>Value of Worker Net Dose Avoided</u> Enter the result from Box E' and multiply by 1,000 \$/person-rem. Enter result on line for item G4.	-214	x \$2,000=	-\$428,000	G4
G5. <u>Value of Public Net Dose Avoided</u> Enter the result from Box E'' and multiply by 1,000 \$/person-rem. Enter result on line for item G5.	1.95	x \$2,000=	\$3,900	G5

Value of Avoid Risks and Damages	Dollars	Item(s)
G6. <u>Estimated Value of Avoided Risks and Damages</u>	\$27,640	G6

Net Benefit

Net benefit on line G3 plus the dollar value of the net dose savings on line for item G4 + G5 plus avoided risks and damages G6, i.e., (G3) + ... (G6).

-\$28,227,970

Box G

Net Benefit Decision Index

1. If the net benefit is greater than 0, proceed to Worksheet H and perform the Qualitative Factor Analysis, then decide whether or not to accept the protective measure.
2. If the net benefit is less than or equal to 0, proceed to Worksheet H and perform the Qualitative Factor Analysis, and either reject the protective measure or reevaluate the \$/person-rem values using a case-specific value for the radiation detriment instead of the value used above.

ATTACHMENT 8. QUALITATIVE FACTOR ANALYSIS WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Questions on Qualitative Factors	
H1. Worker Health and Safety Risks	Group Weighting Factor: _____
<p>H1.1. How well will the implementation of the APM be in either preventing or reducing the radiation exposure to workers over the expected lifetime of the facility/protective measure?</p> <p>Exposure to other health risks (not Quantified previously) by workers are not expected to be significant. Other hazardous substances are present at the HWMF, such as mercury and lead. Mercury concentrations at the former 445-3 underground storage tank (UST) were above the risk remediation goal for a child resident of 23 mg/kg. One soil sample (boring 36A = 429 mg/kg) was above the EPA lead-screening level of 400 mg/kg for soil ingestion using a residential scenario.</p> <p>No Remedial Action: Workers who sample the HWMF monitoring wells could be exposed to the residual levels from these hazardous substances if no remedial actions were taken. However, the risk to present workers was considered minimal since the area that is contaminated is such a small fraction of the site.</p> <p>With Remedial Action: Remedial workers intakes of hazardous materials during remediation was considered minimal, since all workers involved are required to wear protective clothing and half-face respirators. If remedial action was taken, since the radionuclide concentration in this soil is above the DCGL value, this soil that also contains lead and mercury will be removed and the mixed waste disposed of off-site. Therefore, the risk to workers from hazardous substances would eventually be eliminated.</p>	
<p>H1.2. How well will the implementation of the APM be in either preventing or reducing the potential impacts on workers during its installation or during its decommissioning/remediation?</p> <p>See H.1.1 above.</p>	
H2. Public Health and Safety Risks	Group Weighting Factor: _____
<p>H2.1. How well will the implementation of the APM be in either preventing or reducing the current level of public exposure to other risks over the expected lifetime of the facility/protective measure?</p> <p>Exposure to other health risks (not quantified previously) by the public are not expected to be significant.</p> <p>No Remedial Action: The public who may use this open-space site in future could be exposed to the residual levels from the hazardous substances (mercury and lead). However, the risk to future visitors was considered minimal since the area that is contaminated is such a small fraction of the site and the amount of time spent is small.</p> <p>With Remedial Action: As indicated in Section 2.2.3, exposure of the public to the fugitive dust during remedial actions was considered negligible. However, public health and safety risks are expected to be minimal since only trace levels of the hazardous materials exist and only a small percentage of the area is contaminated.</p>	
<p>H2.2. How well will the implementation of the APM be in either preventing or reducing the potential impact on public health from other risks during its installation or during its decommissioning/remediation?</p> <p>See H.2.1 above.</p>	
H3. Environmental Risks	Group Weighting Factor: _____

Questions on Qualitative Factors

H3.1 How well will the implementation of the APM be in either preventing or reducing a potential adverse impact on the natural environment over the expected lifetime of the facility/protective measure?

The environmental risks have the most significant uncertainty.

No Remedial Action: If no remedial action is taken, the radiological risks to the wildlife and the risk from hazardous chemical is not really well known. Since no national monuments or cultural artifacts exist at the HWMF site there are no impacts to these environmental assets expected from no action.

With Remedial Action: If remedial actions are taken in the HWMF wetlands, the potential damage to the wetlands and its impact on local wildlife is unknown. The remediation of the wetland habitat could impact the endangered tiger salamander. Because the HWMF wetlands is a sensitive habitat, timing of the remediation and other precautions will be taken to avoid disturbing the tiger salamander.

H3.2 How well will the implementation of the APM be in either preventing or reducing the destruction of national monuments or cultural artifacts?

No national monuments or cultural artifacts exist.

H4. Community/Worker Concerns

Group Weighting Factor:

H4.1. How large a segment of the public or worker population will be aware or concerned about the problem addressed by the APM?

Most BNL workers and the public are aware of the radioactive contamination at the HWMF.

No Remedial Action: If no remedial action is taken, both groups of stakeholders would be outraged.

With Remedial Action: If remedial actions are taken the concerns of BNL's workers, the public, and politicians would be appeased. The public and politicians appear to be endorsing the option of large-scale excavation and off-site disposal.

H4.2. How much acceptance or interest will the community or worker population be expressing for the implementation of the APM?

The BNL workers, members of the public and politicians have endorsed the large scale excavation and offsite disposal option.

H5. Regulatory Compliance

Group Weighting Factor:

Questions on Qualitative Factors

H5.1. To what degree will the implementation of the APM prevent a violation of a requirement from the DOE orders, federal regulations, or state/local laws?

Remediation of the HWMF site is required by both Federal and State regulations. In addition, an interagency agreement has established the framework for the environmental restoration activities across the site. The U.S. Department of Energy (DOE) is required to comply with the terms and conditions of the associated Federal Facilities Agreement (Administrative Docket Number: II-CERCLA - FFA-00201) which became effective in May 1992.

No Remedial Action: If no remedial action is taken, current legal suits could be jeopardized and additional suits could be filed. Litigation is currently being pursued via a class action suit for civil claims for damages from breast cancer. This suit has been filed with Suffolk County Court by residents from Mastic Beach and Shirley. NYS-DEC and USEPA have taken administrative actions against DOE due to the damage to a natural resource, namely, the sole-source aquifer. Additional liabilities in the range of millions of dollars could result.

With Remedial Action: If remedial actions are taken, the CERCLA rule in 40 CFR 300, to remediate when individual lifetime cancer risks are greater than 1 in 10,000 will be complied. In addition, the DOE rule 10 CFR 834 proposed public dose limit of 100 mrem/yr will also be complied with if excavation and disposal were carried out. The interagency agreement between DOE, EPA and NYS would be met, in part. This potential source of exposure could be argued as being minimal by the defense at trial.

H5.2. How likely is it that the problem to be addressed by the APM, or the implementation of the APM, will be resulting in an allegation from local, state, or regulatory authorities that its personnel are legally liable and subject to civil or criminal penalties?

Litigation is currently being pursued. A class action suit for increased incidences of breast cancer has been filed with Suffolk County Court. NYS - DEC has taken administrative actions against DOE due to the damage to a natural resource namely, the sole source aquifer.

H6. Long Term Effectiveness and Permanence

Group Weighting Factor: _____

H6.1. How effective and permanent will the implementation of the APM be in providing protection against the radiation hazard and/or the spread of radioactive materials during the expected life of the facility/protective measure?

This factor relates to the ability of the remedial action to produce an effective and permanent reduction in radiological and hazardous chemical risk.

No Remedial Action: If no remedial action is taken, effectiveness would be poor and the hazard would not be permanently removed.

With Remedial Action: If remedial actions are taken, very effective and permanent protection is afforded by excavation and disposal. Only minor leaching of residual radioactive material in the soil is expected to occur. Minimal residual risk is expected after the closure of BNL; the estimated dose from residual activity to the reasonable maximum-exposed person is expected to be much less than 15 mrem/yr.

H6.2. How effective and permanent will the implementation of the APM be in producing a minimal residual risk from the radiation hazard and/or the spread of radioactive materials following the conclusion of the expected activities?

Minimal residual risk was expected after the closure of BNL. The estimated dose from residual activity to the reasonable maximum exposed person is expected to be much less than 15 mrem/yr after the closure of BNL.

H7. Reduction of Toxicity, Mobility, or Volume through Treatment

Group Weighting Factor: _____

Questions on Qualitative Factors

H7.1. How well will the implementation of the APM be in reducing the amount of radioactive materials that will be decontaminated, treated, reused, or recycled?

No decontamination, soil washing, recycling or other treatment will be used. Some treatment and recycle options were evaluated during the feasibility study but were considered not to be cost-effective.

H8. Miscellaneous Concerns

Group Weighting Factor: _____

H8.1. How well will the implementation of the APM be in increasing the flexibility of personnel or other resources?

No impacts on personnel or other resources were expected.

H8.2. How well will the implementation of the APM be in improving or maintaining the current level of quality and operation of the facility?

No impacts on facility operations were expected. A new Hazardous Waste Storage Facility has been built and will replace the old HWMF before remedial actions are started.

Hazardous Waste Management Facility
(HWMF):
Excavation/Disposal Cost Spreadsheets

HWMF Rad Soils Remediation Capitol & OM Costs*:							
Excavation to 100 mrem/yr Limit (Cs 137 >1500 pCi/g) and Offsite Disposal							
Created By: Bruce Dionne			C:HWMFSDIG.wb3				
Date Created: 3/1/97							
Date Revised: 4/01/97							
TASK	Totals	Item Costs	CDM Item Description	Quantity	Unit	Cost	Capitol Costs
Phase 1 Excavate/Backfill	\$1,136,045						
Mobilization	\$260,000	\$260,000	(1) Remedial Design Sampling, Analysis & Inspections				
OUI HWMF	\$876,045						
		22,220	(2a) Excavate LSA soils 1,500 - 2,800 pCi/g	2,020	\$11 CY	\$22,220	
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	\$11 CY	\$65,780	
		30,300	(2a3) Backfill LSA ditch with onsite soil	2,020	\$15 CY	\$30,300	
		242,400	(2a4) Verification Sampling for Blending	673	\$360 Sample	\$242,400	
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	\$15 CY	\$89,700	
		1,595	(2f) Excavate Mixed Wastes	145	\$11 CY	\$1,595	
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	\$15 CY	\$2,175	
		162,900	(2g) Excavate clean soil on-site and use for backfill	8,145	\$20 CY	\$162,900	
		250,000	(3) Volume reduction system				
		6,225	(4a) Backfill Wetland				
		2,750	(4b) Replace Vegetation				
Phase 2 Stabilize and Pack Waste	\$2,669,015						
		325,220	(2a2) B-25s for LSA (3CY/B-25)	673	\$483 Container	\$325,220	
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	\$483 Container	\$1,283,771	
		20,826	(2f6) B-25 Boxes for Mixed Waste				
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	\$128 CY	\$1,020,638	
		18,560	(2f1&4) Stabilization of Mixed Waste				
Phase 3 Dispose Mixed Waste	\$163,706						
		21,830	(2f2) Transport OUI Mixed Waste to Envirocare				
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare				
		62,123	(2f5) Transport OUI Mixed Waste to Hanford				
		59,771	(2f7) Disposal of OUI Mixed Waste at Hanford				
Phase 4 Dispose LSA & LLW	\$8,585,366						
Envirocare	\$731,240	381,780	(2a1) Transport OUI LSA to Envirocare	2,020	\$189 CY	\$381,780	
		349,460	(2a2) Disposal of OUI LSA at Envirocare	2,020	\$173 CY	\$349,460	
Hanford	\$7,854,126	4,002,813	(2b2) Transport OUI LLW to Hanford	7,974	\$502 CY	\$4,002,813	
		3,851,313	(2b4) Disposal of OUI LLW at Hanford	7,974	\$483 CY	\$3,851,313	
Management & Oversight	\$2,609,445						
		304,091	Contractor Health and Safety				
		337,541	Permitting and Legal				
		1,687,703	Engineering Construction Services				
		280,110	BNL Oversight and Tech Support				
Planning and Design	\$620,543	620,543	A/E Engineering/Cost Assessment				
Chemical Sampling & Analysis	\$179,100						
		179,100	(5) Remedial Action & Termination Surveys/Analyses				
Operating & Maintenance Costs	\$457,641						
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	\$65 Sample	\$5,200	\$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH)	40	\$65 Sample	\$2,600	\$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	\$360 Analysis	\$5,760	\$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	\$360 Analysis	\$2,880	\$70,613
			(6c1) Termination Survey Labor @ 50 y	200	\$65 Hr	\$260	\$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	\$3,800 Det/Meter	\$608	\$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)				
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	\$65 Report	\$10,400	\$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	\$65 Report	\$5,200	\$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	\$15,000 Report	\$3,000	\$74,876
		12,457	HWMF Maintenance & Security Inspections (O&M)	12	\$40 Hr	\$480	\$12,457
TOTAL >	\$16,420,861						Total O&M > \$457,641
* CDM's OUI FS Appendix I							
Cost Estimates for Alternative 3B:							
Large Scale Excavation/Disposal							

HWMF Rad Soils Remediation Capitol & OM Costs**:						
Excavation to 75 mrem/yr Limit (Cs 137>1135 pCi/g) and Offsite Disposal						
Created By: Bruce Dionne		C:\HWMFSDIG.wb3				
Date Created: 3/1/97						
Date Revised: 4/01/97						
TASK	Totals	Item Costs	CDM Item Description	Quantity	Unit Cost	Units Capitol Costs
Phase 1 Excavate/Backfill	\$1,300,385		(1) Remedial Design Sampling , Analysis & Inspections			
Mobilization	\$260,000	\$260,000	OUI HWMF			
	\$1,040,385					
		33,110	(2a) Excavate LSA soils 1,135 - 2,800 pCi/g	3,010	\$11 CY	\$33,110
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	\$11 CY	\$65,780
		45,150	(2a3) Backfill LSA ditch with onsite soil	3,010	\$15 CY	\$45,150
		361,200	(2a4) Verification Sampling for Blending	1,003	\$360 Sample	\$361,200
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	\$15 CY	\$89,700
		1,595	(2f) Excavate Mixed Wastes	145	\$11 CY	\$1,595
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	\$15 CY	\$2,175
		182,700	(2g) Excavate clean soil on-site and use for backfill	9,135	\$20 CY	\$182,700
		250,000	(3) Volume reduction system			
		6,225	(4a) Backfill Wetland			
		2,750	(4b) Replace Vegetation			
Phase 2 Stabilize and Pack Waste	\$2,828,405					
		484,610	(2a2) B-25s for LSA (3CY/B-25)	1,003	\$483 Container	\$484,610
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	\$483 Container	\$1,283,771
		20,826	(2f6) B-25 Boxes for Mixed Waste			
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	\$128 CY	\$1,020,638
		18,560	(2f1&4) Stabilization of Mixed Waste			
Phase 3 Dispose Mixed Waste	\$163,706					
		21,830	(2f2) Transport OUI Mixed Waste to Envirocare			
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare			
		62,123	(2f5) Transport OUI Mixed Waste to Hanford			
		59,771	(2f7) Dispose of OUI Mixed Waste at Hanford			
Phase 4 Dispose LSA & LLW	\$8,943,746					
Envirocare	\$1,089,620	568,890	(2a1) Transport OUI LSA to Envirocare	3,010	\$189 CY	\$568,890
		520,730	(2a2) Disposal of OUI LSA at Envirocare	3,010	\$173 CY	\$520,730
Hanford	\$7,854,126	4,002,813	(2b2) Transport OUI LLW to Hanford	7,974	\$502 CY	\$4,002,813
		3,851,313	(2b4) Disposal of OUI LLW at Hanford	7,974	\$483 CY	\$3,851,313
Management & Oversight	\$2,609,445					
		304,091	Contractor Health and Safety			
		337,541	Permitting and Legal			
		1,687,703	Engineering Construction Services			
		280,110	BNL Oversight and Tech Support			
Planning and Design	\$620,543	620,543	A/E Engineering/Cost Assessment			
Chemical Sampling & Analysis	\$179,100					
		179,100	(5) Remedial Action & Termination Surveys/Analyses			
Operating & Maintenance Costs	\$457,641					
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)			
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	\$65 Sample	\$5,200
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (SMHF)	40	\$65 Sample	\$2,600
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	\$360 Analysis	\$5,760
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	\$360 Analysis	\$2,880
			(6c1) Termination Survey Labor @ 50 v	200	\$65 Hr	\$260
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	\$3,800 Det/Meter	\$608
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)			
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	\$65 Report	\$10,400
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	\$65 Report	\$5,200
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	\$15,000 Report	\$3,000
		12,457	HWMF Maintenance & Security Inspections (O&M)	12	\$40 Hr	\$480
						Total O&M>
TOTAL>	\$17,102,971					\$457,641
* CDM's OU I FS Appendix I						
Cost Estimates for Alternative 3B: Large Scale Excavation/Disposal						

HWMF Rad Soils Remediation Capital & OM Costs*:								
Excavation to 15 mrem/yr Limit (Cs 137 >227 pCi/g) and Offsite Disposal								
Created By: Bruce Dionne			C:\HWMFSD\IG.wb3					
Date Created: 3/1/97								
Date Revised: 4/01/97								
					Unit			
TASK	Totals	Item Costs	CDM Item Description	Quantity	Cost	Units	Capital Costs	
Phase 1 Excavate/Backfill	\$4,082,545							
Mobilization	\$260,000	\$260,000	(I) Remedial Design Sampling . Analysis & Inspections					
OUI HWMF	\$3,822,545							
		217,470	(2a) Excavate LSA soils 227 - 2,800 pCi/g	19,770	\$11	CY	\$217,470	
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	\$11	CY	\$65,780	
		296,550	(2a3) Backfill LSA ditch with onsite soil	19,770	\$15	CY	\$296,550	
		2,372,400	(2a4) Verification Sampling for Blending	6,590	\$360	Sample	\$2,372,400	
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	\$15	CY	\$89,700	
		1,595	(2f) Excavate Mixed Wastes	145	\$11	CY	\$1,595	
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	\$15	CY	\$2,175	
		517,900	(2g) Excavate clean soil on-site and use for backfill	25,895	\$20	CY	\$517,900	
		250,000	(3) Volume reduction system					
		6,225	(4a) Backfill Wetland					
		2,750	(4b) Replace Vegetation					
Phase 2 Stabilize and Pack Waste	\$5,526,765							
		3,182,970	(2a2) B-25s for LSA (3CY/B-25)	6,590	\$483	Container	\$3,182,970	
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	\$483	Container	\$1,283,771	
		20,826	(2f6) B-25 Boxes for Mixed Waste					
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	\$128	CY	\$1,020,638	
		18,560	(2f1&4) Stabilization of Mixed Waste					
Phase 3 Dispose Mixed Waste	\$163,706							
		21,830	(2f2) Transport OUI Mixed Waste to Envirocare					
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare					
		62,123	(2f5) Transport OUI Mixed Waste to Hanford					
		59,771	(2f7) Dispose of OUI Mixed Waste at Hanford					
Phase 4 Dispose LSA & LLW	\$15,010,866							
Envirocare	\$7,156,740	3,736,530	(2a1) Transport OUI LSA to Envirocare	19,770	\$189	CY	\$3,736,530	
		3,420,210	(2a2) Disposal of OUI LSA at Envirocare	19,770	\$173	CY	\$3,420,210	
Hanford	\$7,854,126	4,002,813	(2b2) Transport OUI LLW to Hanford	7,974	\$502	CY	\$4,002,813	
		3,851,313	(2b4) Disposal of OUI LLW at Hanford	7,974	\$483	CY	\$3,851,313	
Management & Oversight	\$2,609,445							
		304,091	Contractor Health and Safety					
		337,541	Permitting and Legal					
		1,687,703	Engineering Construction Services					
		280,110	BNL Oversight and Tech Support					
Planning and Design	\$620,543	620,543	A/E Engineering/Cost Assessment					
Chemical Sampling & Analysis	\$179,100							
		179,100	(5) Remedial Action & Termination Surveys/Analyses					
Operating & Maintenance Costs	\$457,641							
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				O&M	O&M
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	\$65	Sample	Annualized Cost	Frequency
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MF)	40	\$65	Sample	\$5,200	10
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	\$360	Analysis	\$2,600	44
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	\$360	Analysis	\$5,760	10
			(6c1) Termination Survey Labor @ 50 v	200	\$65	Hr	\$2,880	44
			(6c2) Portable Radiation Monitoring Equipment @ 50 v	8	\$3,800	Det/Meter	\$480	1
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)				\$608	1
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	\$65	Report	\$10,400	10
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	\$65	Report	\$5,200	44
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	\$15,000	Report	\$3,000	9
		12,457	HWMF Maintenance & Security Inspections (O&M)	12	\$40	Hr	\$480	48
								Total O&M >
TOTAL >	\$28,650,611							\$457,641
* CDM's OUI FS Appendix I								
Cost Estimates for Alternative 3B:								
Large Scale Excavation/Disposal								

HWMF Rad Soils Remediation Present Worth of Future OM Costs*:											C:HWMFSDIG.wb2	
	Quantity	Unit Cost	Unit	O&M Annualized Cost	O&M Frequency	NPV						
(6) Long Term Rad. Monitoring @ 8 MW (O&M)												
(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	\$65	Sample	\$5,200	10	\$23,992						
(6a2) Annual Sampling Frequency for yrs 6 to 50 (SMH)	40	\$65	Sample	\$2,600	44	\$63,749						
(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	\$360	Analysis	\$5,760	10	\$26,575						
(6b2) Annual Analysis Frequency for yrs 6 to 50	8	\$360	Analysis	\$2,880	44	\$70,613						
(6c1) Termination Survey Labor @ 50 y	200	\$65	Hr	\$260	1	\$2,965						
(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	\$3,800	Det/Meter	\$608	1	\$6,934						
(7) Long Term Rad/Eco. Monitoring Reports (O&M)												
(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	\$65	Report	\$10,400	10	\$47,983						
(7a2) Annual Reporting Frequency for yrs 6 to 50	80	\$65	Report	\$5,200	44	\$127,497						
(8) CERCLA 5 yr Monitoring Reports (O&M)	1	\$15,000	Report	\$3,000	9	\$74,876						
HWMF Maintenance & Security Inspections (O&M)	12	\$40	Hr	\$480	48	\$12,457						
			(6a1)	(6a2)	(6b1)	(6b2)	(6c1)	(6c2)	(7a1)	(7a2)	(8)	Sec Insp
	1	01/01/97	2600	0	2880	0	0	0	5200	0	0	
		06/01/97	2600	0	2880	0	0	0	5200	0	0	
	2	01/01/98	2600	0	2880	0	0	0	5200	0	0	
		06/01/98	2600	0	2880	0	0	0	5200	0	0	
	3	01/01/99	2600	0	2880	0	0	0	5200	0	0	
		06/01/99	2600	0	2880	0	0	0	5200	0	0	
	4	01/01/00	2600	0	2880	0	0	0	5200	0	0	
		06/01/00	2600	0	2880	0	0	0	5200	0	0	
	5	01/01/01	2600	0	2880	0	0	0	5200	0	0	
		06/01/01	2600	0	2880	0	0	0	5200	0	0	
	1	01/01/97		0		0	0	0		0	0	480
	2	01/01/98		0		0	0	0		0	0	480
	3	01/01/99		0		0	0	0		0	0	480
	4	01/01/00		0		0	0	0		0	0	480
	5	01/01/01		0		0	0	0		0	0	480
	6	01/01/02		2600		2880	0	0		5200	0	480
	7	01/01/03		2600		2880	0	0		5200	0	480
	8	01/01/04		2600		2880	0	0		5200	0	480
	9	01/01/05		2600		2880	0	0		5200	15000	480
	10	01/01/06		2600		2880	0	0		5200	0	480
	11	01/01/07		2600		2880	0	0		5200	0	480
	12	01/01/08		2600		2880	0	0		5200	0	480
	13	01/01/09		2600		2880	0	0		5200	0	480
	14	01/01/10		2600		2880	0	0		5200	15000	480
	15	01/01/11		2600		2880	0	0		5200	0	480
	16	01/01/12		2600		2880	0	0		5200	0	480
	17	01/01/13		2600		2880	0	0		5200	0	480
	18	01/01/14		2600		2880	0	0		5200	0	480
	19	01/01/15		2600		2880	0	0		5200	15000	480
	20	01/01/16		2600		2880	0	0		5200	0	480
	21	01/01/17		2600		2880	0	0		5200	0	480
	22	01/01/18		2600		2880	0	0		5200	0	480
	23	01/01/19		2600		2880	0	0		5200	0	480
	24	01/01/20		2600		2880	0	0		5200	15000	480
	25	01/01/21		2600		2880	0	0		5200	0	480
	26	01/01/22		2600		2880	0	0		5200	0	480
	27	01/01/23		2600		2880	0	0		5200	0	480
	28	01/01/24		2600		2880	0	0		5200	0	480
	29	01/01/25		2600		2880	0	0		5200	15000	480
	30	01/01/26		2600		2880	0	0		5200	0	480
	31	01/01/27		2600		2880	0	0		5200	0	480
	32	01/01/28		2600		2880	0	0		5200	0	480
	33	01/01/29		2600		2880	0	0		5200	0	480
	34	01/01/30		2600		2880	0	0		5200	15000	480
	35	01/01/31		2600		2880	0	0		5200	0	480
	36	01/01/32		2600		2880	0	0		5200	0	480
	37	01/01/33		2600		2880	0	0		5200	0	480
	38	01/01/34		2600		2880	0	0		5200	0	480
	39	01/01/35		2600		2880	0	0		5200	15000	480
	40	01/01/36		2600		2880	0	0		5200	0	480
	41	01/01/37		2600		2880	0	0		5200	0	480
	42	01/01/38		2600		2880	0	0		5200	0	480
	43	01/01/39		2600		2880	0	0		5200	0	480
	44	01/01/40		2600		2880	0	0		5200	15000	480
	45	01/01/41		2600		2880	0	0		5200	0	480
	46	01/01/42		2600		2880	0	0		5200	0	480
	47	01/01/43		2600		2880	0	0		5200	0	480
	48	01/01/44		2600		2880	0	0		5200	0	480
	49	01/01/45		2600		2880	0	0		5200	15000	480
	50	01/01/46		2600		2880	13000	30400		5200		480

@NPV - Present Value of Future Cash Flow

Syntax

@NPV(Rate, Block, <Type>)

Rate = A numeric value > -1, representing the periodic interest rate (the fixed interest rate per compounding period).

Block = A cell block (reference or name) containing cash flow information for the investment.

Type = An optional numeric value that indicates whether payments or cash flows occur at the beginning (1) or the end (0) of the period; default = 0.

@NPV calculates the current value of estimated cash flow values (Block), discounted at the given interest rate (Rate). It is helpful in determining how much an investment is currently worth, based on expected earnings, although its accuracy is entirely dependent on the accuracy of the cash flow table.

The optional third argument, Type, can be 0 or 1, depending on whether the cash flows are at the beginning or the end of the period. The default value is 0, end of the period.

The formula for @NPV(Rate,Block,Type)—if Block consists of $V_1, \dots, V_n$ —is given by

If Type = 0

$$\frac{V_1}{(1+Rate)} + \dots + \frac{V_n}{(1+Rate)^n}$$

If Type = 1

$$V_1 + \frac{V_2}{(1+Rate)} + \dots + \frac{V_n}{(1+Rate)^{n-1}}$$

The cash flow table in Block should show expected income and debits over a period of time. If Type is 0, Quattro* Pro assumes that the amounts are received at the end of regular intervals. If Type is 1, it assumes the amounts are received at the beginning of regular intervals. Quattro Pro also assumes that the length of this interval is the same as the period on which interest is compounded. In other words, if monthly cash flow is estimated, Rate needs to show monthly interest. To convert annual interest to monthly interest, simply divide by 12.

Examples

	A	B	C	D	E
1	1992	1993	1994	1995	1996
2	-5000	+2000	+2000	+2000	+2000

Suppose you are considering investing \$5000 this year, and you expect a return of \$2000 in each of the next four years. Put the values -5000,+2000,+2000,+2000,+2000 in the block A2..E2. The net present value, using a discount rate of 10%, is @NPV(.1,A2..E2,1) which equals \$1,340. Or, combine the initial investment with the present value of the four returns with +A2+@NPV(.1,B2..E2,0). The result is the same.

Additional examples

	A	B	C	D
1	Jan	8000	200	3500
2	Feb	9000	350	4000
3	Mar	8500	-300	3000
4	Apr	9500	600	5000

@NPV(1.25%,B1..B4) = \$33,908.92

@NPV(15%/12,C1..C4) = \$820.83

@NPV(15%/12,D1..D4) = \$15,006.51

-2000+@NPV(15%/12,D1..D4) = \$13,006.51 (assumes an initial cash outflow of \$2,000)

Related Topics