

Katherine Streit
U.S. NRC Region III
2443 Warrenville Road
Suite 210
Lisle, Illinois 60532-4352

RE: Sigma-Aldrich (Sigma) Fort Mims Site, Hydrology Analysis, USNRC License # 24-16273-01 (Mail Control No. 574094)

Dear Ms Streit,

On March 3, 2011, we discussed via telephone NRC's concern regarding the Fort Mims site hydrology with respect to the on-site septic tank. The purpose of this letter is to provide additional information to further justify Sigma's discounting of activity in the septic tank as a significant contributor to dose to the public.

The septic tank was taken out of service approximately 25 years ago following ten years of use supporting operations at the Fort Mims facility. Consistent with Sigma's Radiation Safety Manual, discharge of potentially radioactive wastewaters to the sewer was prohibited, unless authorized by the Radiation Safety Committee.

On May 19, 2010, the septic tank was uncovered during removal of the concrete building pad. The septic tank was found to be approximately 2.4 meters long, 1.2 meters wide, and 1.2 meters deep. The septic tank had a concrete cover, which was partially broken during removal of the soil on top of it. The tank was found to be holding water at a level around the 1 meter depth mark. The water depth was about 15 cm, with the remaining volume consisting of sludge, increasing in density with depth. The tank was covered with plywood and plastic until November 16, 2010 (six months later). The water level remained constant during this time, providing evidence that the septic tank was watertight.

The water phase was pumped to the sewer after verifying the activity concentration of both 14C (high value approximately 20,000 pCi/L and 3H (high value of approximately 16,000 pCi/L) were within acceptable limits for release to the sewer. The sediment (with maximum 14C and 3H concentrations of 792 pCi/g and 13.4 pCi/g, respectively) was transferred to barrels for disposal as Low Level Radioactive Waste. Inspection of the empty, cleaned tank revealed no cracks or other sign of damage that would suggest a potential for leakage.

In spite of the fact that the septic tank appeared not to have leaked at anytime during its use or after taking it out of service, a worst-case RESRAD model (See Attachment) was developed using the following information:

- Area of contaminated Zone: 3.6 m³
- Thickness of Contaminated Zone: 0.8 m
- Thickness of Unsaturated Zone: 0 m

RECEIVED APR 12 2011

- Length Parallel to Aquifer Flow: 2.5 m
- Radionuclide Concentration in Soil: 792 pCi/g 14C; 13.4 pCi/g 3H
- Initial Radionuclide Concentration in Groundwater: 2.00E+04 pCi/L 14C;
1.66E+04 pCi/L 3H

All other soil parameters remained unchanged from the previous site model. The soil concentrations used were the highest measured from samples of material collected inside the tank. The groundwater concentrations used were the highest measured from water samples collected inside the tank. This model assumes the entire content of the septic tank were in direct contact with the saturated zone with no intermediate soil layer and no concrete tank.

The highest annual dose from this model is 2.6 mrem during the first year, with steady decrease in following years.

As a result of the observation that the septic tank appears to be watertight now, it is believed that the septic tank was watertight during its 10 years of use and 25 years of inactivity. This supports the decision to discount the activity detected in the septic tank as a significant contributor of dose to the public.

I hope this adequately address your concerns in this matter.

Best regards,



Thomas K Spencer
Radiation Safety Officer

ATTACHMENT: Additional RESRAD Modeling - Contents of Septic Tank



Fort Mims Facility
Decontamination and Decommissioning Project

**Additional RESRAD Modeling
Contents of Septic Tank**

Sigma Aldrich Company
11542 Fort Mims Drive
Maryland Heights, Missouri

March 31, 2011

Prepared by:

**Philotechnics, Ltd.
201 Renovare Boulevard
Oak Ridge, TN 37830**

TABLE OF CONTENTS

1.0 Executive Summary..... 1

Appendix A: RESRAD Report for Septic Tank

1.0 Executive Summary

Philotechnics developed a RESRAD model to demonstrate the residual radioactivity in soils from licensed activities would not be likely to cause an average member of the critical group to receive a dose, from all sources, in excess of 25 mrem per year. An "industrial worker" occupancy scenario was used, consistent with current and expected land use of the site and surrounding properties. That model and report were sent to U.S. Nuclear Regulatory Commission, Region III (NRC), in December 2010.

During their review, NRC staff requested an additional RESRAD model of the contents of the septic tank formerly located on the property. As previously reported by Philotechnics, the septic tank was located underneath the old building slab and was identified during slab removal. The tank was four feet wide by eight feet long and three feet high. It contained a 30-inch layer of sludge under six inches of water. All of that material was removed as previously described.

NRC staff asked Philotechnics to perform dose modeling on the septic tank contents under the assumption that some of the contents may have leaked out over the years and gone undetected. A RESRAD model was developed using the following information:

- Area of contaminated Zone: 3.6 m³
- Thickness of Contaminated Zone: 0.8 m
- Thickness of Unsaturated Zone: 0 m
- Length Parallel to Aquifer Flow: 2.5 m
- Radionuclide Concentration in Soil: 792 pCi/g ¹⁴C; 13.4 pCi/g ³H
- Initial Radionuclide Concentration in Groundwater: 2.00E+04 pCi/L ¹⁴C;
1.66E+04 pCi/L ³H

All other soil parameters remained unchanged from the previous site model.

The soil concentrations used were the highest measured from samples of material collected inside the tank. The groundwater concentrations used were the highest measured from water samples collected inside the tank. This model assumes the entire content of the septic tank were in direct contact with the saturated zone with no intermediate soil layer and no concrete tank.

The highest annual dose from this model is 2.6 mrem during the first year. The annual dose decreases steadily from that point on.

Appendix A

**RESRAD Report
Septic Tank**

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

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

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	3.600E+00	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	8.000E-01	2.000E+00	---	THICKO
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	2.500E+00	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.000E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	2.000E+01	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): C-14	7.920E+02	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): H-3	1.340E+01	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): C-14	2.000E+04	0.000E+00	0.000E+00	W1(1)
R012	Concentration in groundwater (pCi/L): H-3	1.610E+04	0.000E+00	0.000E+00	W1(2)
R013	Cover depth (m)	1.000E+00	0.000E+00	---	COVERO
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.200E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	1.040E+01	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	4.300E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.200E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	3.730E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.000E+01	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	C-14 (Source: FGR 12)	1.345E-05	1.345E-05	DCF1(1)
A-1	H-3 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	C-14 (p) (Class: ORGANIC)	2.090E-06	2.090E-06	DCF2(1)
B-1	C-14 (g) (Class: CO2)	2.350E-08	2.350E-08	C14GIInhDCF
B-1	H-3	6.400E-08	6.400E-08	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	C-14	2.090E-06	2.090E-06	DCF3(1)
D-1	H-3	6.400E-08	6.400E-08	DCF3(2)
D-34	Food transfer factors:			
D-34	C-14 , plant/soil concentration ratio, dimensionless	5.500E+00	5.500E+00	RTF(1,1)
D-34	C-14 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.100E-02	3.100E-02	RTF(1,2)
D-34	C-14 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.200E-02	1.200E-02	RTF(1,3)
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(2,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(2,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(2,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	C-14 , fish	5.000E+04	5.000E+04	BIOFAC(1,1)
D-5	C-14 , crustacea and mollusks	9.100E+03	9.100E+03	BIOFAC(1,2)
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(2,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(2,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETEG table in Ground Pathway of Detailed Report.

*Base Case means Default.Lib w/o Associate Nuclide contributions.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	0.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.200E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	3.730E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	1.040E+01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for C-14				
R016	Contaminated zone (cm**3/g)	5.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+00	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	5.000E+00	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.966E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	4.000E-02	0.000E+00	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	4.000E-02	0.000E+00	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	4.000E-02	0.000E+00	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.539E+00	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	2.500E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	1.700E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	6.000E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMLK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
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	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	2.000E-05	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	3.000E-02	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	2.000E-02	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	9.800E-01	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	3.000E-01	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	7.000E-07	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	1.000E-10	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	8.000E-01	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	2.000E-01	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	128	---	---	NPTS

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	3.60 square meters	C-14	7.920E+02
Thickness:	0.80 meters	H-3	1.340E+01
Cover Depth:	1.00 meters		

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 1.000E+01 mrem/yr

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	2.566E+00	2.349E+00	1.998E+00	1.143E+00	2.317E-01	8.703E-04	1.024E-10	0.000E+00
M(t):	2.566E-01	2.349E-01	1.998E-01	1.143E-01	2.317E-02	8.703E-05	1.024E-11	0.000E+00

Maximum TDOSE(t): 2.566E+00 mrem/yr at t = 0.000E+00 years

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	8.619E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	8.619E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	2.537E+00	0.9885	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.537E+00	0.9885
H-3	2.947E-02	0.0115	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.947E-02	0.0115
Total	2.566E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.566E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	8.317E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	8.317E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	2.343E+00	0.9974	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.343E+00	0.9974
H-3	6.005E-03	0.0026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.005E-03	0.0026
Total	2.349E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.349E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	7.744E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	7.744E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	1.997E+00	0.9999	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.997E+00	0.9999
H-3	2.472E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.472E-04	0.0001
Total	1.998E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.998E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	6.033E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	6.033E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	1.143E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.143E+00	1.0000
H-3	3.498E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.498E-09	0.0000
Total	1.143E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.143E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	2.955E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	2.955E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	2.317E-01	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.317E-01	1.0000
H-3	4.885E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.885E-23	0.0000
Total	2.317E-01	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.317E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
C-14	2.432E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	2.432E-24	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	8.703E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.703E-04	1.0000
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	0.0000
Total	8.703E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.703E-04	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	1.936E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	1.936E-27	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	1.024E-10	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.024E-10	1.0000
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	0.0000
Total	1.024E-10	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.024E-10	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Water Independent Pathways (Inhalation excludes radon)

Radio- 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.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio- 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.
C-14	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
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	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g)							
			0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14	C-14	1.000E+00	3.203E-03	2.958E-03	2.522E-03	1.443E-03	2.926E-04	1.099E-06	1.293E-13	0.000E+00
H-3	H-3	1.000E+00	2.199E-03	4.482E-04	1.845E-05	2.610E-10	3.645E-24	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.000E+01 mrem/yr

Nuclide (i)	t =	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
C-14		3.122E+03	3.380E+03	3.965E+03	6.931E+03	3.418E+04	9.100E+06	*4.455E+12	*4.455E+12
H-3		4.547E+03	2.231E+04	5.421E+05	3.831E+10	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
C-14	7.920E+02	0.000E+00	3.203E-03	3.122E+03	3.203E-03	3.122E+03
H-3	1.340E+01	0.000E+00	2.199E-03	4.547E+03	2.199E-03	4.547E+03

Summary : RESRAD Default Parameters Industrial Worker Scenario

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SEPTIC WORST CASE.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr								
			t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03	
C-14	C-14	1.000E+00	2.537E+00	2.343E+00	1.997E+00	1.143E+00	2.317E-01	8.703E-04	1.024E-10	0.000E+00	
H-3	H-3	1.000E+00	2.947E-02	6.005E-03	2.472E-04	3.498E-09	4.885E-23	0.000E+00	0.000E+00	0.000E+00	

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g								
			t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03	
C-14	C-14	1.000E+00	7.920E+02	7.313E+02	6.234E+02	3.567E+02	7.233E+01	2.716E-01	3.196E-08	0.000E+00	
H-3	H-3	1.000E+00	1.340E+01	2.719E+00	1.119E-01	1.584E-06	2.211E-20	0.000E+00	0.000E+00	0.000E+00	

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

RESCALC.EXE execution time = 2.35 seconds



SIGMA-ALDRICH

3500 DeKalb Street • Saint Louis, Missouri 63118

PRESORTED
FIRST CLASS



usps.com

049362051802

\$01.222

04/05/2011

Mailed From 63144
US POSTAGE

XX APR-06-11 ST. LOUIS MO 631 RETURN SERVICE REQUESTED

Katherine Streit
U.S. NRC Region III
2443 Warrenville Rd., Suite 210
Lisle, Illinois 60532-4352

RECEIVED APR 12 2011