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Hanford Site Annual Report Radiological Dose Calculation Upgrade Evaluation

SF Snyder

February 2010

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Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

Operations at the Hanford Site, Richland, Washington, may result in the release of radioactive materials to the environment in the form of airborne and liquid effluents. Site authorities are required by regulation and by U.S. Department of Energy Orders to estimate the dose to the maximally exposed member of the public and to demonstrate that those doses remain within established standards. Due to the low magnitude of releases in recent years, computer models, rather than environmental samples, are used to estimate exposure, intake, and dose. Since 1989, a DOS-based model has been used for dose estimation (GENII version 1.485). GENII v1.485 has been updated to a Windows®-based software package (GENII version 2.08). Use of the updated software would facilitate future dose evaluations, but must be demonstrated to provide results comparable to those of GENII v1.485. This report describes the GENII v1.485 and GENII v2.08 exposure, intake, and dose estimates for the maximally exposed offsite resident reported for calendar year 2008. The GENII v2.08 results reflect updates to implemented algorithms. No two environmental models produce exactly the same results, as was again demonstrated in this report. However, the aggregated dose results from 2008 Hanford Site airborne and surface water exposure scenarios for both software versions were shown to be comparable. Therefore, the GENII v2.08 software is recommended for future evaluations to demonstrate compliance with federal and state standards for dose to a member of the public. In addition to the benchmarking reported, future proposed federal changes to radiological impact estimates for both members of the public and other biota would be readily implemented within the GENII v2.08 code, whereas continued use of GENIIv1.485 for those evaluations would require substantial supplemental efforts.

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1.0 Introduction

The calendar year 2008 (CY08) Hanford Annual Report presents an estimate of radiation dose to the maximally exposed individual (MEI). As was done in the past, the GENII software package version 1.485 (Gv1.485) was used (Napier et al. 1988). The dose estimation followed the procedures developed and documented in Schreckhise et al. (1993) and, to some extent, in DOE (2008). The CY08 final dose estimates were reviewed and reported in the Hanford Annual Environmental Report (Poston et al. 2009). Gv1.485 has been revised in GENIIv2 (Gv2) (Napier 2008; Napier et al., 2008). In the interest of updating the dose estimation process to be consistent with newer dispersion and dosimetry models, Gv2 is being considered for future Hanford Annual Environmental Report dose estimates.

Gv2 implements some environmental models in a different manner than they were incorporated in Gv1.485. The air dispersion model and tritium model are two significant changes between the versions. This report intends to capture the differences that could be expected from the use of Gv2 by mimicking the CY08 Gv1.485 inputs for the Sagemoor MEI within the Gv2 framework. The Surface Water Release and Atmospheric Release Hanford Site scenarios evaluated in CY08 are implemented. The comparative results of both GENII versions are presented.

The Hanford Annual Report calculations provide dose estimates for two release types (Surface Water and Air) and their associated exposure pathways (inhalation, external exposure, terrestrial foods, and aquatic foods). Table 1.1 indicates dose endpoints evaluated for an individual living at Sagemoor based on Hanford Site Air and Surface Water releases during CY08. The environmental release locations at the Hanford Site for CY08 are also shown. Table 1.2 indicates the nuclides included in the Surface Water and Air releases for CY08, with some additional nuclides indicated from other recent years' evaluations.

Table 1.1. Release Types and Pathways

Pathway	Surface Water Releases[(a)] from 100 and 200 Areas	Airborne Releases[(b)] from 100, 200, 300, and 400 Areas
External exposure	08SWXTn	08ATXTn
Inhalation	08SWINn	08ATINn
Aquatic food	08SWFSn	N/A
Terrestrial food	08SWFDn	08ATFDn

(a) Column entries: YYLRPPA, where YY = calendar year (08); L = MEI location (S = Sagemoor); R = surface water (W); PP = pathway (XT, IN, FS, FD); n = source material release location (1 = 100 Area, etc.)
(b) Column entries: YYATPPn, where YY = calendar year (08); AT = atmospheric pathway; PP = pathway (XT, IN, FD); n = source material release location (1 = 100 Area, etc.).
N/A = Not applicable.

1.1 GENII v1.485

GENII version 1.485 is a DOS-based code, circa 1988, created at the Pacific Northwest National Laboratory specifically for Hanford environmental dosimetry calculations. It was developed to be adaptable to many different environmental conditions beyond the Hanford Site. It requires user input to create a scenario-specific input file. The input file is then processed by a series of code executable files, using associated data-array files, to create a main output file. In addition, there are a number of intermediate output files to which the user can refer for some intermediate calculation details.

Table 1.2. Hanford CY08 Nuclide Releases (Hanford Area release location indicated)

Nuclide	Surface Water	Airborne
H-3 (and OBT)	200	300, 400
Kr-85	N/A	300
Sr-90	100	100, 200, 300
Y-90 (Sr-90 progeny)	100	100, 200, 300
I-129	N/A	200
Xe-131m	N/A	300
Xe-133	N/A	300
Xe-135	N/A	300
Cs-137	N/A	200, 300, 400
Pb-212	N/A	300
Rn-222	N/A	300
Th-231 (Pu-239 progeny)	200	N/A
Pa-234 (U-238 progeny)	200	N/A
Th-234 (U-238 progeny)	200	N/A
U-234	200	N/A
U-238	200	N/A
Np-239 (Am-243 progeny)	N/A	300
Pu-238	N/A	200, 300
Pu-239	100	100, 200, 300, 400
Pu-241	N/A	100, 200
Am-241	N/A	100, 200, 300
Am-243	N/A	300

N/A = Not applicable.
OBT = Organically bound tritium.
Th-231 could also be Np-239 progeny or U-235 progeny.

1.2 GENIIv2

GENII version 2.08a (version current in August 2009[1]) is a Windows®-based code, circa 2008. It was created for the U.S. Environmental Protection Agency to incorporate updated internal dosimetry models and risk estimation procedures. Its Windows® utility was implemented within a highly adaptive user interface called FRAMES (Whelan et al. 1997). The FRAMES (**F**ramework for **R**isk **A**nalysis in **M**ultimedia **E**nvironmental **S**ystems) interface allows the user to customize exposure and dose scenarios by specifying:

- contaminant databases
- inventory release modules
- environmental dispersion modules
- environmental uptake modules
- receptor intake modules
- health impact modules.

The code produces output for each module. To create GENIIv2, GENIIv1.485 functions were modified (e.g., unit conversions) to fit the various parts of FRAMES. The implementation of the radon model in v2.08 is a simplified model that does not include consideration of working levels due to limitations in the FRAMES and GENII module handling of chain decay. The radon model and chain decay handling of Gv2 also affects the radon dose calculations. Tritium modeling is also different in Gv2. Organically-bound tritium (OBT) is modeled in Gv2, whereas it was not specifically modeled in Gv1.485. A Quality Assurance (QA) program, based on American National Standards Institute standard NQA-1, as implemented in the PNNL Quality Assurance Manual, was used for code testing of GENIIv2. The QA programs for both versions have been reviewed by the Department of Energy (DOE 2003, DOE 2004).

[1] GENII version 2.09 was released in October 2009. It corrects issues identified in v2.08. One issue resolution was implemented for this report because it impacted a scenario under evaluation. Other issues identified for the version 2.09 revision did not impact scenarios evaluated in this report.

2.0 Mimicking GENIIv1.485 Surface Water Scenario in GENIIv2

Some of the Gv1.485 input values can be directly implemented within Gv2. Others were not so straightforward, and led to consultations with the code developer. The Gv2 input is reviewed in this section for model selection and parameter input. The Surface Water scenario is discussed first because it is simpler than the Air scenarios (fewer nuclides and release points). The models implemented in each Gv2 module are tabulated in Table 2.1. When a model is selected, the user is prompted to enter scenario specific input within the module.

Table 2.1. Models Implemented for the Surface Water Scenarios

Module	Module Model Implemented	Section Reference
Contaminant database	GENII Radionuclide Database Selection (v2.08a 20NOV2008)	2.1
Release Module (boundary condition)	WFF Surface Water Module (v1.7 01JUN2006)	2.2
Environmental Dispersion Module	GENII V.2 Surface Water Module (v2.08a 20NOV2008)	2.3
Environmental Uptake Module	GENII V.2 Chronic Exposure Module (v2.08a10SEP2009[a])	2.4
Receptor Intake Module	GENII V.2 Receptor Intake Module (v2.08a 20NOV2008)	2.5
Health impact Module	GENII V.2 Health Impacts Module (v2.08a 20NOV2008)	2.6

(a) Update to correct issues related to external dose from surface water exposure.

Input parameters are identified in the *.DES files generated by Gv2. The parameter values implemented for the CY08 Hanford Annual Report calculations are presented in the following sections, as closely as possible to the order in which it is input.

2.1 Contaminant Database Input

The same Gv2 Contaminant Database selection is used for all Surface Water scenarios. Different parameters were used in scenario-specific calculations, but typically all data were entered for all scenarios. Input for this component varies by nuclide. Items such as transfer factors, dose factors, water treatment removal factors, and bioconcentration factors are included. Virtually all the necessary nuclide-specific information, other than release rates, is entered in this module. Table 2.2 indicates nuclide-specific values needed for Surface Water scenarios in Gv2, with the Gv1.485 data source file indicated.

Table 2.2. Surface Water Scenario Nuclide Specific Input

Gv2 Variable	Description	Units	Edit Constituent Properties Tab – Nuclide-Specific Inputs											GI.485 Data Source
			H3	OBT	Sr90	Y90	Cs137	Pa234	Th234	U234	U235	U238	Pu239	
CLKD	The dry soil-water partition coefficient	mL/g	0	0	0	0	0	0	0	0	0	0	0	Personal comm., code developer
CLANDF	Inhalation Volatilization Factor for Indoors	m^3/L	0	0	0	0	0	0	0	0	0	0	0	Personal comm., code developer
CLWPF	The water purification factor	fraction	1	1	0.2	0.2	0.9	0.7	0.7	0.7	0.7	0.7	0.7	BIOACH.dat
CLDFAD	Inhalation Dose Factor, class Day	rem/pCi	6.40IE-11	0	2.39E-07	0	3.19E-08	0	0	0	0	0	0	RMDLib.DAT(class); ICRP30 with units conversion(value)
CLDFAW	Inhalation Dose Factor, class Week	rem/pCi	0	0	0	0	0	0	0	0	0	0	0	RMDLib.DAT(class); ICRP30 with units conversion(value)
CLDFAY	Inhalation Dose Factor, class Year	rem/pCi	0	0	0	8.44E-09	0	8.14E-10	3.50E-08	1.32E-04	1.23E-04	1.18E-04	3.08E-04	RMDLib.DAT(class); ICRP30 with units conversion(value)
CLRDFGS	Ingestion Dose Factor, soluble	rem/pCi	6.40E-11	6.40E-11	1.42E-07	0	5.00E-08	0	0	0	0	0	0	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 with units conversion. Default Sr90 ing DF in Gv2 is less soluble than Gv1.485 value. For this scenario, most soluble Sr90 DF entered.
CLRDFGI	Ingestion Dose Factor, insoluble	rem/pCi	0	0	0	1.08E-08	0.00E+00	2.16E-09	1.37E-08	2.61E-08	2.67E-08	2.38E-08	5.18E-08	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 with units
CLDEX	External Dose Factor, Air Immersion	rem/h per pCi/m^3	8.02E-20	8.02E-20	1.48E-13	5.36E-12	4.15E-10	1.45E-09	1.63E-11	1.50E-13	7.05E-11	1.03E-13	7.68E-14	GRDF.jks with units conversion
CLDIMR	External Dose Factor, Water Immersion	rem/h per pCi/L	1.21E-19	1.21E-19	2.07E-13	7.34E-12	6.16E-10	1.88E-09	2.11E-11	2.16E-13	9.62E-11	1.49E-13	1.09E-13	GRDF.jks with units conversion
CLDSH	External Dose Factor, Ground Surface	rem/h per pCi/m^2	2.25E-20	2.25E-20	6.19E-15	1.38E-13	8.44E-12	2.81E-11	3.94E-13	2.79E-14	1.91E-12	2.28E-14	1.18E-14	GRDF.jks with units conversion and divided by 0.15m (thickness of
CLDSH5	External Dose Factor, Ground Contaminated to 5cm	rem/h per pCi/m^3	0	0	0	0	0	0	0	0	0	0	0	Shortest depth for which information is avail. is 15 cm
CLDSH15	External Dose Factor, Ground Contaminated to 15cm	rem/h per pCi/m^3	0	0.00E+00	5.40E-19	1.62E-16	2.25E-14	1.04E-13	8.65E-16	1.17E-19	3.78E-16	1.31E-21	1.39E-19	GRDF.jks with units conversion
CLLCLAS	The lung solubility class	0	<D>	<D>	<D>	<Y>	<D>	<Y>	<Y>	<Y>	<Y>	<Y>	<Y>	RMDLIB.dat Data not entered. Listed here for reference.
CLDIAM	Inhalation Dose Factor Particle Diameter	um												Not implemented in this module in current Gv2. Leave as is.
CLBFF	Bioaccumulation in Wet Fish from Freshwater	L/kg	1	1	50	25	2000	30	100	50	50	50	250	BIOACH.dat
CLBFM	Bioaccumulation in Wet Mollusk from Freshwater	L/kg	1	1	100	1000	100	30	100	100	100	100	100	BIOACH.dat
CLBFI	Bioaccumulation in Wet Crustacea from Freshwater	L/kg	1	1	100	1000	100	30	100	100	100	100	100	BIOACH.dat

Table 2.2. (contd)

Gv2 Variable	Description	Units	Edit Constituent Properties Tab – Nuclide-Specific Inputs											GI.485 Data Source
			H3	OBT	Sr90	Y90	Cs137	Pa234	Th234	U234	U235	U238	Pu239	
CLBFP	Bioaccumulation in Wet Plants from Freshwater	L/kg	1	1	3000	5000	500	300	3000	900	900	900	890	BIOACH.dat
CLBSAF	Bioaccumulation in Wet Biota from Sediment	kg/kg												Not implemented in current Gv2, leave default as is.
CLFMT	Feed to Meat Transfer Factor	day/kg	1	1	0.0008	0.001	0.03	0.005	0.005	0.0002	0.0002	0.0002	0.000002	FTRANS.dat
CLFMK	Feed to Milk Transfer Factor	day/L	1	1	0.0013	0.000005	0.007	0.0000025	0.0000025	0.0006	0.0006	0.0006	0.0000001	FTRANS.dat
CLFPL	Feed to Poultry Transfer Factor	day/kg	1	1	0.035	0.001	4.4	0.004	0.004	1.2	1.2	1.2	0.00015	FTRANS.dat
CLFEG	Feed to Egg Transfer Factor	day/kg	1	1	0.3	0.002	0.49	0.002	0.002	0.99	0.99	0.99	0.008	FTRANS.dat
CLBVLV	Bioconcentration in dry Leafy Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat
CLBVRV	Bioconcentration in dry Root Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat
CLBVFR	Bioconcentration in Dry Fruit from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat
CLBVCL	Bioconcentration in dry Cereal from Soil	kg/kg	1	1	0.2	0.001	0.01	0.02	0.0004	0.0004	0.0004	0.0004	0.00004	FTRANS.dat
CLBVAF	Bioconcentration in dry Animal Forage from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat (leafy veg)
CLBVAH	Bioconcentration in dry Animal Hay from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat (leafy veg)
CLBVAG	Bioconcentration in dry Animal Grain from Soil	kg/kg	1	1	0.2	0.001	0.01	0.02	0.0004	0.0004	0.0004	0.0004	0.00004	FTRANS.dat (grain)
CLBVOV	Bioconcentration in Dry Other Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.05	0.004	0.004	0.004	0.004	0.0004	FTRANS.dat (root)
CLVD	The atmospheric deposition velocity	m/sec	0	0	0.001	0.001	0.001	1.00E-03	0.001	0.001	0.001	0.001	0.001	FTRANS.dat
CLSHALF	The decay half-life in Soil	day	9.81E+02	9.81E+02	1.71E+05	1.42E+06	1.90E+06	3.42E+06	5.78E+08	6.96E+03	6.96E+03	6.96E+03	4.75E+06	Use defaults. Applicable to irrigated soil leaching.
CLCLASS	The atmospheric deposition class		blank	blank	blank	blank	blank	blank	blank	blank	blank	blank	blank	N/A for Surf water scenario

2.2 Release Module Input

Virtually the same Gv2 Release Module input is used for all Surface Water scenarios. The only difference is that scenarios must vary by release location, so each release location has its own source material activity released. Whereas atmospheric release scenarios can model several release sites in a single scenario, surface water release scenarios can only model one release site at a time. Input for this component varies by nuclide for some parameters. Only a one year release is considered, so a time dimension is not implemented in this analysis. The release rates for progeny nuclides are indicated by a 1 pCi/y "seed" value. This seed value is not required for the decay chain calculations but was the preference of the author to assure acknowledgement of progeny considered for each parent. See input data in Table 2.3.

Table 2.3. Surface Water Release Module Input (boundary condition)

					Release Location	
					100 Area	200 Area
Gv2 Variable:	one	two	ctime	cval	cval	
Description	Width	Height	Time	Constituent flux	Constituent flux	
flux plane	10 m	10 m	yr:			
river water			0, 1	3068 m3/s		
H3			0, 1		0	1400 Ci/yr
OBT			0, 1		0	0
Sr90			0, 1		2.1E-4 Ci/yr	0
Y90			0, 1		1 pCi/yr	0
Pa234			0, 1		0	1 pCi/yr
Th234			0, 1		0	1 pCi/yr
U234			0, 1		0	0.97 Ci/yr
U238			0, 1		0	2.9 Ci/yr
Pu239			0, 1		7.7E-6 Ci/yr	0
G1.485 data source	(a)	(a)	GENII input files. <River water flow not used from here, but enter value anyway.> Enter same release values in years 0 and 1, as Dissolved Flux.			

(a) Not used for this module/scenario, but a value of zero is not accepted by Gv2 software.

2.3 Surface Water Dispersion Module Input

The Surface Water Dispersion Module simulates dispersion of the released nuclides into the surface water using the model selected by the user and calculates the water concentration values at the MEI location. The Sagemoor receptor was determined as the maximally exposed member of the public for the CY08 Hanford Annual Report calculations. Input values for the other two potential MEI locations (Riverview and Ringold) are also presented in Table 2.4 as a reference for future evaluations. Four Surface Water models are available in this Gv2 module. The Chronic Flow Dilution is appropriate for this CY08 scenario.

Table 2.4. Surface Water Dispersion Module Input with Sagemoor, Riverview, and Ringold Data

Gv2 Variable	Description	Units	MEI Location			G1.485 Data Source
			Sagemoor	Riverview	Ringold	
GNSWTYPE	Type of release and body of water	N/A	CF	CF	CF	(a)
GNSWTREL	Duration of the release to the surface water	yr	1	1	1	
GNSWTT	Travel time in surface water	h	100 Area: 19 h; 200 Area: 11 h	100 Area: 19 h; 200 Area: 11 h	100 Area: 8 h; 200 Area: 0 h	input files
GNSWDSCHG	Total volumetric flow rate of river	m^3/sec	3068	3068	3068	input files

(a) Model types: Acute river (A); Chronic river (C); Chronic near-shore lake (CL); Chronic Flow Dilution (CF).

2.4 Environmental Uptake Module Input

Three major pathways were considered in the Surface Water scenarios for the Sagemoor MEI:

- Ingestion of irrigated food, including external exposure to irrigated garden soil (Food-Terrestrial).
- Ingestion of freshwater fish (Food-Aquatic).
- Incidental ingestion of water while swimming and external exposure from recreation shoreline activities, fishing, and swimming (Recreation/External Exposure).

Columbia River water as a domestic water source was not assumed for the Sagemoor resident. The Environmental Uptake Module input requires a variable number of input parameters, depending on the pathway under evaluation. The Environmental Uptake Module output provides radionuclide concentrations in food products consumed by the MEI. The most extensive input is required for the Terrestrial Food pathway with its various crop (leafy vegetables, root vegetables, fruit, grain, animal feed, and animal forage) and animal products (meat, eggs, milk, poultry). These terrestrial food inputs are presented first (Section 2.4.1). Later sections (Section 2.4.2 for aquatic food and Section 2.4.3 for external exposure) present only the inputs that differ from those presented in Section 2.4.1.

2.4.1 Food-Terrestrial

The Terrestrial Food pathway evaluates intakes of leafy vegetables, root vegetables, fruit, grain, meat, eggs, milk, and poultry contaminated via surface water or irrigated food consumption. In addition, the receptor is assumed to receive external dose from exposure to the irrigated soil. Input values are provided in Table 2.5 and Table 2.6.

2.4.2 Food-Aquatic

The Aquatic Food pathway evaluated intakes of fish caught in the Columbia River. Table 2.7 provides only those input values that differ from the Terrestrial Food pathway. Many of the parameters from the terrestrial pathway did not need to be reset because when the pathway flag is turned off pathway values do not need to be set to zero.

Table 2.5. Surface Water Chronic Exposure Module – Terrestrial Food Inputs[1]

Gv2 Variable	Description	Major Tab: / Minor Tab: / Units	Controls / <one>	Water / <mult>	Soil / <mult>	Agric. / General	Agric. / Animal Feed/<mult>	Agric. / Food Crop/<mult>	Agric. / Intake Delays	Pathways / <one>	G1.485 Data Source
ANFOOD	Animal product ingestion	N/A	X								input file
TFOOD	Terrestrial food crop ingestion	N/A	X								input file
AQFOOD	Aquatic food ingestion	N/A	N/A								
RECRE	Recreational surface water	N/A	N/A								
DEBUG	Debug testing	N/A	N/A								
NTKEND	Duration of exposure period	yr	1								input file
RELEND	End of release period	yr	1								input file
BEFORE	Time from start to exposure	yr	0 yr								input file
ABSHUM	Absolute humidity, used only for tritium model	kg/m^3	0.008 kg/m^3								DEFAULT.IN
RF1	Fraction of plants roots in surface soil	fraction	1								<undefined in Gv1.485>
RAIN	Average daily rain rate	mm/d	0.01 mm/d								<not used in Gv1.485; zero not accepted>
BEFAIR	Air deposition time prior to exposure	yr	0 yr								
ISALT	Aquatic foods from salt water (versus fresh water)	N/A		N/A							input file
DWTRET	Treatment plant purification of domestic water	N/A		X							input file
RESIRR	Residential irrigation	N/A		X							input file
IRRSR	Source of residential irrigation	N/A		Surface Water							input file
RIRRR	Irrigation rate for residential land	in/yr		40 in/yr							input file
IRTIMR	Irrigation time for residential land	mon/yr		6 mo/yr							input file
BEFIRR	Irrigation water deposition time prior to exposure	yr		0 yr							
DWSRC	Source of domestic water	N/A		Surface Water							input file

[1] See Table 2.6 when "See FdFrLabel," "See TFDLabel," and "See ANFLabel" is indicated.

Table 2.5. (contd)

Gv2 Variable	Description	Major Tab: / Minor Tab: / Units	Controls <one>	Water <mult>	Soil <mult>	Agric. General	Agric. Animal Feed/<mult>	Agric. Food Crop/<mult>	Agric. Intake Delays	Pathways <one>	G1.485 Data Source
ANDKRN	Indoor volatilization factor for radon	l/m^3		N/A							<non-functioning>
ANDKR	Indoor volatilization factor for radionuclides	l/m^3		N/A							<non-functioning>
HOLDDW	Delay time in water distribution system	day		1 d							input file
SEDDN	Shoreline sediment density	kg/m^2		224 kg/m^2							DEFAULT.IN
DWFACA	Animal water contaminated fraction	fraction		See ANFlabel							<undefined in Gv1.485>
DWATER	Intake rate of water	L/d		See ANFlabel							DEFAULT.IN
IRRST	Source of irrigation	N/A		See TFDLabel							input file
IRRSA	Source of animal feed irrigation	N/A		See FdFrLabel							input file
RIRR	Irrigation rate	in/yr		See TFDLabel							input file
RIRRA	Animal feed irrigation rate	in/yr		See FdFrLabel							input file
IRTIMT	Irrigation time	mon/yr		See TFDLabel							input file
IRTIMA	Animal feed irrigation time	mon/yr		See FdFrLabel							input file
LEACHOPTION	Type of leach rate constant	N/A			GENII default leach rates						<FTRANS.dat>
IRES	Type of resuspension model	N/A			No resusp						<no inhalation intakes>
SLDN	Surface soil areal density	kg/m^2			224 kg/m^2						DEFAULT.IN
SURCM	Surface soil layer thickness used for density	cm			15 cm						DEFAULT.IN
SSLDN	Surface soil density	kg/m^3			1500 kg/m^3						DEFAULT.IN

Table 2.5. (contd)

Gv2 Variable	Description	Major Tab: / Minor Tab: / Units	Controls / <one>	Water / <mult>	Soil / <mult>	Agric. / General	Agric. / Animal Feed/<mult>	Agric. / Food Crop/<mult>	Agric. / Intake Delays	Pathways / <one>	G1.485 Data Source
HARVST	Radionuclide removal due to harvesting	N/A				X					<Not implemented for one-yr release, but activate anyway>
DRYSET	User defined dry deposition interception fraction to plants	N/A				N/A					
DEPFR1	Dry deposition retention fraction to plants	fraction				N/A					
WETSET	User defined wet deposition interception fraction to plants	N/A				X					<default>
DEPFR2	Wet deposition retention fraction to plant surfaces	fraction				0.25					DEFAULT.IN
LEAFRS	Resuspension factor from soil to plant surfaces	1/m				1E-9 per m					DEFAULT.IN
DPVRES	Deposition velocity from soil to plant surfaces	m/s				0.001 m/s					DEFAULT.IN
WTIM	Weathering rate constant from plants	d				14 d					DEFAULT.IN
BIOMA2	Standing animal feed biomass (wet)	kg/m^2					See FdFrLabel				DEFAULT.IN
CONSUM	Consumption rate	kg/d					See FdFrLabel				DEFAULT.IN
STORTM	Storage time	day					See FdFrLabel				input file
DIETFR	Fraction of diet	fraction					See FdFrLabel				input file
GRWPA	Animal feed growing period	day					See FdFrLabel				input file
YELDA	Yield for animal feed	kg/m^2					See FdFrLabel				input file
DRYFA2	Animal feed dry/wet ratio	fraction					See FdFrLabel				DEFAULT.IN
TRANSA	Translocation factor for animal feed	fraction					See FdFrLabel				DEFAULT.IN
SLCONA	Animal daily soil consumption rate	kg/d					See FdFrLabel				<not in Gv1.485>
BIOMAS	Standing biomass (wet)	kg/m^2						See TFDLabel			DEFAULT.IN
GRWP	Growing period	day						See TFDLabel			input file
YELD	Yield	kg/m^2						See TFDLabel			input file

Table 2.5. (contd)

Gv2 Variable	Description	Major Tab: / Minor Tab: / Units	Controls / <one>	Water / <mult>	Soil / <mult>	Agric. / General	Agric. / Animal Feed/<mult>	Agric. / Food Crop/<mult>	Agric. / Intake Delays	Pathways / <one>	G1.485 Data Source
DRYFAC	Dry/wet ratio	fraction						See TFDLabel			DEFAULT.IN
TRANS	Translocation factor	fraction						See TFDLabel			DEFAULT.IN
HLDUP	Time from harvest to ingestion	day							See TFDLabel		input file
HLDUPA	Time from harvest to animal ingestion	day							See ANFlabel		input file
HLDUP2	Time from harvest to ingestion	day							N/A		
ANF	Meat Ingestion pathway	N/A								See ANFlabel	input file
TFD	Veg Ingestion pathway	N/A								See TFDLabel	input file
AQF	Aqu Ingestion pathway	N/A								N/A	
DRINK	Drinking water	N/A								N/A	
SHING	Inadvertent shower water	N/A								N/A	
SWING	Inadvertent swimming water	N/A								N/A	
SLING	Inadvertent soil	N/A								N/A	
SLINH	Suspended or resuspended soil	N/A								N/A	
SHINDR	Indoor or showering	N/A								N/A	
REC	External pathway	N/A								N/A	
GROUND	Soil external	N/A								X	input file
AIREXT	External air	N/A								N/A	
FINITE	Finite plume model	N/A								N/A	

Table 2.6. Additional Information for Terrestrial Food Pathway Inputs in Table 2.5 (FdFrLabel, ANFLabel, and TFDLabel Input)

Gv2 Variable	Description	Units	FdFrLabel						ANFLabel (food eaten by receptor)				TFDLabel				G1.485 Data Source
			Meat-feed	Poultry-feed	Milk-feed	Egg-feed	Meat-forage	Milk-forage	Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	
DWFACA	Animal water contaminated fraction	fraction							1	1	1	1					<undefined in Gv1.485>
DWATER	Intake rate of water	L/d							50	0.3	60	0.3					DEFAULT.IN
IRRST	Source of irrigation	N/A											Surf W	Surf W	Surf W	none	input file
IRRSA	Source of animal feed irrigation	N/A	none	none	SurfW	none	SurfW	SurfW									input file
RIRR	Irrigation rate	in/yr											35	40	35	0	input file
RIRRA	Animal feed irrigation rate	in/yr	0	0	47	0	47	47									input file
IRTIMT	Irrigation time	mon/yr											6	6	6	0	input file
IRTIMA	Animal feed irrigation time	mon/yr	0	0	6	0	6	6									input file
BIOMA2	Standing animal feed biomass (wet)	kg/m^2	0.8	0.8	1	0.8	1	1.5									DEFAULT.IN
CONSUM	Consumption rate	kg/d	68	0.12	55	0.12	68	55									DEFAULT.IN
STORTM	Storage time	day	180	180	100	180	100	0									input file
DIETFR	Fraction of diet	fraction	0.25	1	0.25	1	0.75	0.75									input file
GRWPA	Animal feed growing period	day	90	90	45	90	45	30									input file
YELDA	Yield for animal feed	kg/m^2	0.8	0.8	2	0.8	2	1.5									input file
DRYFA2	Animal feed dry/wet ratio	fraction	0.18	0.18	0.18	0.18	0.2	0.2									DEFAULT.IN
TRANSA	Translocation factor for animal feed	fraction	0.1	0.1	0.1	0.1	1	1									DEFAULT.IN
SLCONA	Animal daily soil consumption rate	kg/d							0	0	0	0					<not in Gv1.485>
BIOMAS	Standing biomass (wet)	kg/m^2											2	2	3	0.8	DEFAULT.IN
GRWP	Growing period	day											90	90	90	90	input file
YELD	Yield	kg/m^2											1.5	4	2	0.8	input file
DRYFAC	Dry/wet ratio	fraction											0.1	0.25	0.18	0.18	DEFAULT.IN
TRANS	Translocation factor	fraction											1	0.1	0.1	0.1	DEFAULT.IN

Table 2.6. (contd)

Gv2 Variable	Description	Units	FdFrLabel						ANFLabel (food eaten by receptor)				TFDLabel				G1.485 Data Source
			Meat-feed	Poultry-feed	Milk-feed	Egg-feed	Meat-forage	Milk-forage	Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	
HLDUP	Time from harvest to ingestion	day											1	5	5	180	input file
HLDUPA	Time from harvest to animal ingestion	day							15	1	1	1					input file
HLDUP2	Time from harvest to ingestion	day															
ANF	Meat Ingestion pathway	N/A							X	X	X	X					input file
TFD	Veg Ingestion pathway	N/A											X	X	X	X	input file

Table 2.7. Chronic Exposure Module-Aquatic Food Input (differences only from those in Table 2.5 and Table 2.6)

Gv2 Variable	Description	Major Tab: / Minor Tab: / Units	Controls <one>	Water <mult>	Agric. Intake Delays	Pathways <one>	G1.485 Data Source	AQFLabel Fish	AQFLabel Mollusca	AQFLabel Crusacea	AQFLabel Aquatic Plants
ANFOOD	Animal product ingestion	N/A	N/A				input file				
TFOOD	Terrestrial food crop ingestion	N/A	N/A				input file				
AQFOOD	Aquatic food ingestion	N/A	X				input file				
DWTRET	Treatment plant purification of domestic water	N/A		N/A			input file				
RESIRR	Residential irrigation	N/A		N/A			input file				
HLDUP2	Time from harvest to ingestion	day			See AQFlabel		input file	1	0	0	0
ANF	Meat Ingestion pathway	N/A				N/A					
TFD	Veg Ingestion pathway	N/A				N/A					
AQF	Aqu Ingestion pathway	N/A				See AQFlabel		X	N/A	N/A	N/A
DRINK	Drinking water	N/A				N/A					

2.4.3 Recreation/External Exposure

The recreation exposure pathways for Surface Water scenarios consist of external exposure from recreation on the river and incidental ingestion of water while swimming. Boating, swimming, and shoreline recreation were modeled. Table 2.8 includes only those input values that differ from those of the Terrestrial Food pathway.

Table 2.8. Chronic Exposure Module-Surface Water Recreation Input (differences only from those in Table 2.5 and Table 2.6)

Variable	Description	Units	Controls	Pathways	G1.485 Data Source
ANFOOD	Animal product ingestion	N/A	N/A		input file
TFOOD	Terrestrial food crop ingestion	N/A	N/A		input file
RECRE	Recreational surface water	N/A	X		input file
ANF	Meat Ingestion pathway	N/A		N/A	input file
TFD	Vegetation Ingestion pathway	N/A		N/A	input file
DRINK	Drinking water	N/A		N/A	input file
SWING	Inadvertent swimming water	N/A		X	input file
REC(1)	Swimming External	N/A		X	input file
REC(2)	Boating External	N/A		X	input file
REC(3)	Shoreline External	N/A		X	input file

2.5 Receptor Intake Module Input

The Receptor Intake Module uses the radioactive material concentrations calculated in the Environmental Uptake Module, assigns intake or exposure rates, and provides intake rates as output. Due to its large number of intake categories, the Terrestrial Food exposure pathway requires the most input. As with the Environmental Uptake Module, if the pathway is turned off, parameter values related to non-relevant pathways for a given scenario were not reset to zero. Gv2 has the capability to consider a number of age groups. However, Gv1.485 only calculates results for adults, so a single comparable age group (20–70 yrs old) is evaluated with Gv2.

2.5.1 Food – Terrestrial

Table 2.9 provides the extensive list of parameter values for the Surface Water scenario Receptor Module for the Terrestrial Food pathway.

2.5.2 Food-Aquatic and External

The intake and exposure rates for the Aquatic Food and for the Recreation/External pathways of the Surface Water Scenario are provided in Table 2.10. Few values from the Food-Terrestrial input set were changed for each of these pathways. Values need not be reset to zero if the pathway is not considered within the scenario.

Table 2.9. Receptor Intake Module – Surface Water Terrestrial Food Input

Gv2 Variable	Description	Pathway Selection	Input	ANFLabel (food eaten by receptor)				TFDLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
NAGES	Number of age groups	One entry all Pathway selections	1													<default>
LOWAGE	Lower ager limit	One entry all Pathway selections	20 yr													adult age group default
UPAGE	Upper age limit	One entry all Pathway selections	70 yr													adult age group default
UEXAIR	Daily plume immersion exposure time	External exposure to air	0 h													input file
TEXAIR	Yearly plume immersion exposure time	External exposure to air	365 d/yr													N/A
SHIN	Indoor shielding factor	External ground exposure	1													0
SHOUT	Outdoor shielding factor	External ground exposure	1													0
UEXGRD	Daily external ground exposure time	External ground exposure	12 h													input file (4380 hr/yr)
TEXGRD	Yearly external ground exposure time	External ground exposure	365 d/yr													N/A
FTIN	Fraction of time spent indoors	External ground exposure	0.7													N/A
FTOUT	Fraction of time spent outdoors	External ground exposure	0.3													N/A

Table 2.9. (contd)

Gv2 Variable	Description	Pathway Selection	Input	ANFLabel (food eaten by receptor)				TDFLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
EVSWIM	Frequency of swimming event	External exposure while swimming; Water ingestion while swimming	0 event/d													N/A
TESWIM	Duration of swimming event	External exposure while swimming; Water ingestion while swimming	0 h													input file
TSWIM	Swimming days	External exposure while swimming; Water ingestion while swimming	50 d													N/A
USWIM	Ingestion rate of water while swimming	External exposure while swimming; Water ingestion while swimming	0 L/h													N/A
SFBOAT	Shielding factor	External exposure while boating	1													N/A
EVBOAT	Frequency of boating event	External exposure while boating	0 event/d													N/A
TEBOAT	Duration of boating event	External exposure while boating	0 h													input file

Table 2.9. (contd)

Gv2 Variable	Description	Pathway Selection	Input	ANFLabel (food eaten by receptor)				TDFLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
TBOAT	Boating days	External exposure while boating	50 d													N/A
EVSHOR	Frequency of shoreline use	External exposure to shoreline	0 event/d													
TESHOR	Duration of shoreline use events	External exposure to shoreline	0 h													input file
TSHOR	Shoreline days	External exposure to shoreline	100 d													N/A
SWFAC	Shoreline width factor	External exposure to shoreline	0.2													N/A
UCRP	Crop consumption rate	Food crop ingestion	See TFDLabel					30 kg/y	220 kg/y	330 kg/y	80 kg/y					input file
TCRP	Crop consumption period	Food crop ingestion	See TFDLabel					365 d	365 d	365 d	365 d					<default>
UANM	Animal product consumption rate	Animal product ingestion	See ANFLabel	80 kg/y	18 kg/y	270 kg/y	30 kg/y									input file
TANM	Animal product consumption period	Animal product ingestion	See ANFLabel	365 d	365 d	365 d	365 d									<default>
UAQU	Aquatic food consumption rate	Aquatic food ingestion	See AQFLabel									0 kg/d	0 kg/d	0 kg/d	0 kg/d	input file
TAQU	Fish consumption period	Aquatic food ingestion	See AQFLabel									365 d	365 d	365 d	365 d	N/A
UDW	Drinking water ingestion rate	Drinking water ingestion	0 L/d													input file

Table 2.9. (contd)

Gv2 Variable	Description	Pathway Selection	Input	ANFLabel (food eaten by receptor)				TDFLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
TDW	Drinking water ingestion period	Drinking water ingestion	365 d/yr													input file
EVSHWR	Frequency of showering event	Water ingestion while showering	0 event/d													N/A
TESHWR	Duration of showering event	Water ingestion while showering	0 h													input file
TSHWR	Showering days	Water ingestion while showering	365 d													N/A
USHIN	Ingestion rate of water while showering	Water ingestion while showering	0													N/A
TSOIL	Soil contact days	Inadvertent soil ingestion	365 d													N/A
USOIL	Inadvertent soil ingestion rate	Inadvertent soil ingestion	0 mg/d													input file
UINH	Air inhalation rate	Air inhalation	0 m3/d													input file
TINH	Air inhalation period	Air inhalation	365 d													N/A
FRINH	Fraction of a day indoor inhalation occurs	Air Inhalation	0.25													N/A
UINHR	Resuspended soil inhalation rate	Resuspended soil inhalation	0 m3/d													input file
TINHR	Resuspended soil inhalation period	Resuspended soil inhalation	365 d/yr													N/A

Table 2.9. (contd)

Gv2 Variable	Description	Pathway Selection	Input	ANFLabel (food eaten by receptor)				TDFLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
FRINHR	Fraction of a day inhalation occurs	Resuspended soil inhalation	1													N/A
UINDRH	Indoor air inhalation rate	Indoor air inhalation	0													input file
TINDRH	Indoor air inhalation period	Indoor air inhalation	365 d/yr													N/A
FRINDR	Fraction of a day indoor inhalation occurs	Indoor air inhalation	0.75													N/A
EQFRAC	Radon progeny indoor equilibrium fraction	<indoor air Rn>	N/A													

Table 2.10. Receptor Intake Module – Surface Water-Aquatic Food and Recreation Input

Gv2 Variable	Description	Pathway Selection	Input	AQFLabel				Gv1.485 Data Source
				Fish	Mollusca	Crusacea	Aquatic Plants	
For Aquatic Food Ingestion Pathway								
UAQU	Aquatic food consumption rate	Aquatic food ingestion	See AQFLabel	40 kg/yr				input file
For Surface Water External Exposure Pathway								
EVSWIM	Frequency of swimming event	External exposure while swimming; Water ingestion while swimming	1 event/d					input file
TESWIM	Duration of swimming event	External exposure while swimming; Water ingestion while swimming	2 hr/event					input file
TSWIM	Swimming days	External exposure while swimming; Water ingestion while swimming	50 swim days					input file
USWIM	Ingestion rate of water while swimming	External exposure while swimming; Water ingestion while swimming	0.02 L/h					DEFAULT.IN
SFBOAT	Shielding factor	External exposure while boating	1					<default in Gv1.485>
EVBOAT	Frequency of boating event	External exposure while boating	1 event/d					input file
TEBOAT	Duration of boating event	External exposure while boating	2 hr/event					input file
TBOAT	Boating days	External exposure while boating	50 boat days					input file
EVSHOR	Frequency of shoreline use	External exposure to shoreline	1 event/d					input file
TESHOR	Duration of shoreline use events	External exposure to shoreline	5 hr/event					input file
TSHOR	Shoreline days	External exposure to shoreline	100 beach days					input file
SWFAC	Shoreline width factor	External exposure to shoreline	0.2					DEFAULT.IN

2.6 Health Impact Module Input

The Health Impact Module input is the same for all Surface Water scenario pathways. The method selected is the first option, "Calculate radiation dose and risk using ICRP 30/48 factors (Federal Guidance Reports 11/12)." The Method Parameters indicates selection of the committed effective dose equivalent (CEDE). For scenarios with External Exposure pathways, the soil thickness and density must match that entered in the Environmental Uptake module. The cancer conversion factors are not used for the current analysis, so values were set to code defaults. See input values in Table 2.11.

Table 2.11. Health Impact Module Input

Gv2 Variable	Description	Units	Method Selection	Method Parameters	GENII v1.485 Source
METHOD	Calculate how?	N/A	FGR 11/12		<defaults implemented>
HECONINC	Cancer incidence conversion factor	risk/Sv		0.06	<not implemented>
HECONFAT	Cancer fatality conversion factor	risk/Sv		0.05	<not implemented>
HECEDE	Calculate radiation effective dose equivalent commitment	N/A		X	
SOILT	Thickness of contaminated soil/sediment layer	m		0.15 m	match Exp module input
SLDN	Density of contaminated soil/sediment layer	kg/m^3		1500 kg/m^3	match Exp module input

3.0 Mimicking GENIIv1.485 Atmospheric Release Scenario in GENIIv2

As with the Surface Water Release scenarios, some Gv1.485 input values can be directly implemented within Gv2 for the Atmospheric Release scenarios ("Air scenarios"). Some input values were not straightforward, and led to consultations with the code developer. The Gv2 model selection and parameter value input is presented in this section. The models implemented in Gv2 Modules for Atmospheric Release scenarios are tabulated in Table 3.1. Only the Release and Environmental Dispersion modules selected in the Air scenario differ from the modules selected for the Surface Water scenario.

Table 3.1. Models Implemented for Air Release Scenarios

Module	Module Model Implemented	Section Reference
Contaminant database	GENII Radionuclide Database Selection (v2.08a 20NOV2008)	3.1
Release Module (boundary condition)	AFF Air Module (v1.7 01JUN2006)	3.2
Environmental Dispersion Module	GENII V.2 Air Module – Chronic Plume (v2.08a 20NOV2008)	3.3
Environmental Uptake Module	GENII V.2 Chronic Exposure Module (v2.08a 10SEP2009[(a)])	3.4
Receptor Intake Module	GENII V.2 Receptor Intake Module (v2.08a 20NOV2008)	3.5
Health Impact Module	GENII V.2 Health Impacts Module (v2.08a 20NOV2008)	3.6

(a) See Table 2.1.

When a model is selected, the user is prompted to enter specific input within the module. Input parameters are identified in the *.DES files generated by Gv2. The parameter values implemented for the CY08 Hanford Annual Report calculations are presented in the following sections, as closely as possible to the order in which they were input.

3.1 Contaminant Database Input

The same Gv2 Contaminant Database selection was used for all Air Release scenario pathway evaluations. Different parameters were implemented by the code in scenario-specific calculations, but typically all data were entered for all scenarios. Input for this component varies by nuclide; for example, variables such as transfer factors, dose factors, water treatment removal factors, and bioconcentration factors are included. Virtually all necessary nuclide-specific information, other than release rates, is entered in this module. Due to the larger list of nuclides in the Air Scenarios, the input values are listed in two tables: Table 3.2 provides information for H3, organically bound tritium (OBT), Sr90, Y90, Cs137, I129, Rn220, Pb212, and Bi212. Table 3.3 provides information for Rn222, Pb210, Bi210, Po210, Pu238, Pu239, Am241, Am243, and Np239. These tables indicate the nuclide-specific values implemented, with the Gv1.485 data source file indicated.

Table 3.2. Air Scenario Nuclide Specific Entries (radionuclide set 1)

			Edit Constituent Properties Tab – Nuclide-Specific Inputs									
Gv2 Variable	Description	Units	H3	OBT	Sr90	Y90	Cs137	I129	Rn220	Pb212	Bi212	G1.485 Data Source
CLKD	The dry soil-water partition coefficient	mL/g	0	0	0	0	0	0	0	0	0	Personal communication (code developer)
CLANDF	Inhalation Volatilization Factor for Indoors	m3/L	0	0	0	0	0	0	0	0	0	Personal communication (code developer)
CLWPF	The water purification factor	fraction	1	1	0.2	0.2	0.9	0.8	0	0.9	0.9	BIOACH.dat
CLDFAD	Inhalation Dose Factor, class Day	rem/pCi	6.40E-11	0	2.39E-07	0	3.19E-08	1.74E-07	0	1.69E-07	0	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLDFAW	Inhalation Dose Factor, class Week	rem/pCi	0	0	0	0	0	0	0	0	1.91E-08	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLDFAY	Inhalation Dose Factor, class Year	rem/pCi	0	0	0	8.44E-09	0	0	0	0	0	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLRDFGS	Ingestion Dose Factor, soluble	rem/pCi	6.40E-11	6.40E-11	1.42E-07	0	5.00E-08	2.76E-07	0	4.55E-08	1.06E-09	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 (FGR11) with units conversion. Default Sr90 ing DF in Gv2 is less soluble than Gv1.485 value. For this scenario, most soluble Sr90 DF entered.
CLRDFGI	Ingestion Dose Factor, insoluble	rem/pCi	0	0	0	1.08E-08	0	0	0	0	0	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 with units conversion.
CLDEX	External Dose Factor, Air Immersion	rem/hr per pCi/m3	8.02E-20	0	1.48E-13	5.36E-12	4.15E-10	6.54E-12	2.46E-13	9.54E-11	1.18E-09	GRDF.jks with units conversion. Rn220 value from FGR12.
CLDIMR	External Dose Factor, Water Immersion	rem/hr per pCi/L	1.21E-19	1.21E-19	2.07E-13	7.34E-12	6.16E-10	9.50E-12	5.37E-16	1.31E-10	1.47E-09	GRDF.jks with units conversion. Rn220 value from FGR12.
CLDSH	External Dose Factor, Ground Surface	rem/hr per pCi/m2	2.25E-20	2.25E-20	6.19E-15	1.38E-13	8.44E-12	4.53E-13	3.38E-14	2.31E-12	1.88E-11	GRDF.jks with units conversion and divided by 0.15 m (thickness of contaminated soil). Rn220 value from FGR12.
CLDSH5	External Dose Factor, Ground Contaminated to 5cm	rem/hr per pCi/m3	0	0	0	0	0	0	0	0	0	Shortest depth for which information is available is 15 cm.
CLDSH15	External Dose Factor, Ground Contaminated to 15cm	rem/hr per pCi/m3	0	0	5.40E-19	1.62E-16	2.25E-14	2.41E-22	1.47E-16	1.55E-15	1.43E-13	GRDF.jks with units conversion; Rn220 value from FGR12.
CLLCLAS	The lung solubility class	D/W/Y	<D>	<D>	<D>	<Y>	<D>	<D>	<D>	<D>	<W>	RMDLIB.dat. Data not entered, listed here for reference.
CLDIAM	Inhalation Dose Factor Particle Diameter	µm										Not implemented in this module in current Gv2. Leave as is.
CLBFF	Bioaccumulation in Wet Fish from Freshwater	L/kg	1	1	50	25	2000	50	0	2000	15	BIOACH.dat
CLBFM	Bioaccumulation in Wet Mollusk from Freshwater	L/kg	1	1	100	1000	100	100	0	500	100000	BIOACH.dat
CLBFI	Bioaccumulation in Wet Crustacea from Freshwater	L/kg	1	1	100	1000	100	100	0	500	100000	BIOACH.dat
CLBFP	Bioaccumulation in Wet Plants from Freshwater	L/kg	1	1	3000	5000	500	300	0	2000	1500	BIOACH.dat

Table 3.2. (contd)

Gv2 Variable	Description	Units	Edit Constituent Properties Tab – Nuclide-Specific Inputs									G1.485 Data Source
			H3	OBT	Sr90	Y90	Cs137	I129	Rn220	Pb212	Bi212	
CLFMT	Feed to Meat Transfer Factor	day/kg	1	1	0.0008	0.001	0.03	0.002	0	0.0004	0.017	FTRANS.dat
CLFMK	Feed to Milk Transfer Factor	day/L	1	1	0.0013	0.000005	0.007	0.012	0	0.00003	0.0005	FTRANS.dat
CLFPL	Feed to Poultry Transfer Factor	day/kg	1	1	0.035	0.001	4.4	0.018	0	0.00099	0.00099	FTRANS.dat
CLFEG	Feed to Egg Transfer Factor	day/kg	1	1	0.3	0.002	0.49	2.8	0	0.00099	0.00099	FTRANS.dat
CLBVLV	Bioconcentration in dry Leafy Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat
CLBVRV	Bioconcentration in dry Root Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat
CLBVFR	Bioconcentration in Dry Fruit from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat
CLBVCL	Bioconcentration in dry Cereal from Soil	kg/kg	1	1	0.2	0.001	0.01	0.4	0	0.01	0.6	FTRANS.dat
CLBVAF	Bioconcentration in dry Animal Forage from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat (leafy veg)
CLBVAH	Bioconcentration in dry Animal Hay from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat (leafy veg)
CLBVAG	Bioconcentration in dry Animal Grain from Soil	kg/kg	1	1	0.2	0.001	0.01	0.4	0	0.01	0.6	FTRANS.dat (grain)
CLBVOV	Bioconcentration in Dry Other Vegetables from Soil	kg/kg	1	1	2	0.01	0.02	0.4	0	0.1	0.6	FTRANS.dat (root)
CLAPLV	Bioconcentration in Dry Leafy Vegetables from Air	kg/kg										Not used in Gv2 model
CLAPF	Bioconcentration in Dry Animal Forage from Air	kg/kg										Not used in Gv2 model
CLVD	The atmospheric deposition velocity	m/sec	<0>	<0>	<0.001>	<0.001>	<0.001>	<0.01>	<0>	<0.001>	<0.001>	FTRANS.dat. Values presented here, to indicate those used in Gv1.485. Values input in CON of Gv2 are NOT implemented in Gv2. Code uses its own values.
CLSHALF	The decay half-life in Soil	day	9.81E+02	9.81E+02	1.71E+05	1.42E+06	1.90E+06	1.46E+04	4.11E+02	7.60E+07	8.55E+05	Use defaults. Applicable to irrgated soil leaching. (conversion of FTRANS.dat data)
CLCLASS	The atmospheric deposition class	0	blank	blank	blank	blank	blank	blank	blank	blank	blank	Not implemented in this module in current Gv2.

Table 3.3. Air Scenario Nuclide Specific Entries (radionuclide set 2)

Gv2 Variable	Description	Units	Edit Constituent Properties Tab – Nuclide-Specific Inputs									G1.485 Data Source
			Rn222	Pb210	Bi210	Po210	Pu238	Pu239	Am241	Am243	Np239	
CLKD	The dry soil-water partition coefficient	mL/g	0	0	0	0	0	0	0	0	0	Personal communication (code developer)
CLANDF	Inhalation Volatilization Factor for Indoors	m3/L	0	0	0	0	0	0	0	0	0	Personal communication (code developer)
CLWPF	The water purification factor	fraction	0	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.7	BIOACH.dat
CLDFAD	Inhalation Dose Factor, class Day	rem/pCi	0	1.36E-05	0	0	0	0	0	0	0	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLDFAW	Inhalation Dose Factor, class Week	rem/pCi	0	0	1.96E-07	8.58E-06	0	0	4.44E-04	4.40E-04	2.51E-09	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLDFAY	Inhalation Dose Factor, class Year	rem/pCi	0	0	0	0	2.88E-04	3.08E-04	0	0	0	RMDLib.DAT(class); ICRP30 (per FGR11) with units conversion(value)
CLRDFGS	Ingestion Dose Factor, soluble	rem/pCi	0	5.37E-06	6.40E-09	1.90E-06	0	0	3.65E-06	3.62E-06	3.26E-09	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 (FGR11) with units conversion. Default Sr90 ing DF in Gv2 is less soluble than Gv1.485 value. For this scenario, most soluble Sr90 DF entered.
CLRDFGI	Ingestion Dose Factor, insoluble	rem/pCi	0	0	0	0	4.96E-08	5.18E-08	0	0	0	Assume from Inh: D and W=soluble, Y=insoluble; ICRP30 with units conversion.
CLDEX	External Dose Factor, Air Immersion	rem/hr per pCi/m3	1.38E-09	9.12E-13	8.99E-13	6.54E-15	1.15E-13	7.68E-14	7.89E-12	1.99E-11	1.11E-10	GRDF.jks with units conversion. Rn220 value from FGR12.
CLDIMR	External Dose Factor, Water Immersion	rem/hr per pCi/L	1.79E-09	1.30E-12	1.24E-12	8.14E-15	1.68E-13	1.09E-13	1.11E-11	2.76E-11	1.51E-10	GRDF.jks with units conversion. Rn220 value from FGR12.
CLDSH	External Dose Factor, Ground Surface	rem/hr per pCi/m2	2.50E-11	8.72E-14	2.81E-14	1.24E-16	2.81E-14	1.18E-14	3.66E-13	7.31E-13	2.81E-12	GRDF.jks with units conversion and divided by 0.15 m (thickness of contaminated soil). Rn220 value from FGR12.
CLDSH5	External Dose Factor, Ground Contaminated to 5cm	rem/hr per pCi/m3	0	0	0	0	0	0	0	0	0	Shortest depth for which information is available is 15 cm.
CLDSH15	External Dose Factor, Ground Contaminated to 15cm	rem/hr per pCi/m3	1.19E-13	5.53E-24	1.33E-17	4.11E-19	3.68E-23	1.39E-19	3.03E-20	7.68E-18	1.34E-15	GRDF.jks with units conversion; Rn220 value from FGR12.
CLLCLAS	The lung solubility class	D/W/Y	<D>	<D>	<W>	<W>	<Y>	<Y>	<W>	<W>	<W>	RMDLIB.dat. Data not entered, listed here for reference.
CLDIAM	Inhalation Dose Factor Particle Diameter	µm										Not implemented in this module in current Gv2. Leave as is.
CLBFF	Bioaccumulation in Wet Fish from Freshwater	L/kg	0	2000	15	50	250	250	100	100	2500	BIOACH.dat
CLBFM	Bioaccumulation in Wet Mollusk from Freshwater	L/kg	0	500	100000	20000	100	100	100	100	30	BIOACH.dat
CLBFI	Bioaccumulation in Wet Crustacea from Freshwater	L/kg	0	500	100000	20000	100	100	100	100	30	BIOACH.dat
CLBFP	Bioaccumulation in Wet Plants from Freshwater	L/kg	0	2000	1500	2000	890	890	3000	3000	300	BIOACH.dat

Table 3.3. (contd)

Gv2 Variable	Description	Units	Edit Constituent Properties Tab – Nuclide-Specific Inputs									G1.485 Data Source
			Rn222	Pb210	Bi210	Po210	Pu238	Pu239	Am241	Am243	Np239	
CLFMT	Feed to Meat Transfer Factor	day/kg	0	0.0004	0.017	0.0045	0.000002	0.000002	0.00002	0.00002	0.001	FTRANS.dat
CLFMK	Feed to Milk Transfer Factor	day/L	0	0.00003	0.0005	0.00012	0.0000001	0.0000001	0.0000003	0.0000003	0.00001	FTRANS.dat
CLFPL	Feed to Poultry Transfer Factor	day/kg	0	0.00099	0.00099	0.00099	0.00015	0.00015	0.0002	0.0002	0.004	FTRANS.dat
CLFEG	Feed to Egg Transfer Factor	day/kg	0	0.00099	0.00099	0.00099	0.008	0.008	0.009	0.009	0.002	FTRANS.dat
CLBVLV	Bioconcentration in dry Leafy Vegetables from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat
CLBVRV	Bioconcentration in dry Root Vegetables from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat
CLBVFR	Bioconcentration in Dry Fruit from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat
CLBVCL	Bioconcentration in dry Cereal from Soil	kg/kg	0	0.01	0.6	0.001	0.00004	0.00004	0.0002	0.0002	0.1	FTRANS.dat
CLBVAF	Bioconcentration in dry Animal Forage from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat (leafy veg)
CLBVAH	Bioconcentration in dry Animal Hay from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat (leafy veg)
CLBVAG	Bioconcentration in dry Animal Grain from Soil	kg/kg	0	0.01	0.6	0.001	0.00004	0.00004	0.0002	0.0002	0.1	FTRANS.dat (grain)
CLBVOV	Bioconcentration in Dry Other Vegetables from Soil	kg/kg	0	0.1	0.6	0.01	0.0004	0.0004	0.002	0.002	1	FTRANS.dat (root)
CLAPLV	Bioconcentration in Dry Leafy Vegetables from Air	kg/kg										Not used in Gv2 model
CLAPF	Bioconcentration in Dry Animal Forage from Air	kg/kg										Not used in Gv2 model
CLVD	The atmospheric deposition velocity	m/sec	<0>	<0.001>	<0.001>	<0.001>	<0.001>	<0.001>	<0.001>	<0.001>	<0.001>	FTRANS.dat. Values presented here, to indicate those used in Gv1.485. Values input in CON of Gv2 are NOT implemented in Gv2. Code uses its own values.
CLSHALF	The decay half-life in Soil	day	4.11E+02	7.60E+07	8.55E+05	1.04E+06	4.75E+06	4.75E+06	1.42E+06	1.42E+06	2.41E+04	Use defaults. Applicable to irrgated soil leaching. (conversion of FTRANS.dat data)
CLCLASS	The atmospheric deposition class	0	blank	blank	blank	blank	blank	blank	blank	blank	blank	Not implemented in this module in current Gv2.

3.2 Release Module Input

Virtually the same Gv2 Release Module input is used for all Air scenarios. The only differences for the Hanford Site calculations were the scenarios' release inventory, which is specific to its release location, and the stack height, which is 10 m for the 100, 300, and 400 Areas and 89 m for the 200 Area. Although Gv2 can model several atmospheric release sites in a single scenario, each release point was modeled independently to more readily compare the Gv2 and Gv1.485 results. Input for this component varies by nuclide for some parameters. Non-radionuclide-specific input is shown in Table 3.4. Only a one-year release is considered, so a time dimension is not implemented in this analysis. Radionuclide-specific input is provided in Table 3.5.

Table 3.4. Air Scenario Release Module Input for Non-Radionuclide Specific Variables

Gv2 Variable	Description	Units	Value	G1.485 data source
media	Type of release	N/A	POINT	Input file
fluxtypes	Use suspended particle/gas	N/A	Press button for default particle/gas info	Accept defaults listed below, even for I-129.
reactivefrac	Reactive gas fraction	fraction	0	Accept default
reactivedensity	Reactive gas density	g/cm^3	0	Accept default
radius	Radius	µm	Partic1, 3 µm default	<Gv2 default>
density	Density	g/cm^3	Partic1, 1.5 g/cm^3 default	<Gv2 default>
one	Exit area of source	m^2	1 m2	
two	Exit height of source	m	100,300,400 Areas: 10 m; 200 Area: 89 m	Input file. Varies by release location.
three	Height of adjacent structure	m	10 m	
four	Exit velocity	m/s	3 m/s	Assumption, somewhat random, but generates good match to Gv1.485 air concentrations.
five	Exit temperature of source	C	10°C	Code developer advice. Use same value as ambient.
six	Ambient air temperature	C	10°C	Code developer advice
ctime	Time	yr	see nuclide-specific data	Enter same release in each yr indicated.
cval	Constituent flux		see nuclide-specific data	Manually assign Bi212 rls from Rn220 (differs from Gv1.485 which only manually assigned Pb212 activity). Enter same release rate for each year.

Table 3.5. Air Scenario Release Module Input for Radionuclide-Specific Variables

Gv2 Variable:		ctime	cval			
Description:		Time	Constituent Flux			
Units:		yr	Units Indicated Below by Nuclide and Release Location			
			100 Area	200 Area	300 Area	400 Area
	H3	0, 1	0	0	180 Ci/yr	0
	OBT	0, 1	0	0	0	0
	Sr90	0, 1	1.3E-5 Ci/yr	9.9E-5 Ci/yr	5.7E-6 Ci/yr	0
Sr90 progeny	Y90	0, 1	1 pCi/yr	1 pCi/yr	1 pCi/yr	0
	Cs137	0, 1	0	3.18E-5 Ci/yr	5.2E-7 Ci/yr	9E-6 Ci/yr
	I129	0, 1	0	1.3E-3 Ci/yr	0	0
	Rn220	0, 1	0	0	74 Ci/yr	0
Rn220 progeny	Pb212	0, 1	0	0	0.11 Ci/yr	0
Rn220 progeny	Bi212	0, 1	0	0	1.16 Ci/yr	0
	Rn222	0, 1	0	0	1.7 Ci/yr	0
Rn222 progeny	Pb210	0, 1	0	0	1 pCi/yr	0
Rn222 progeny	Bi210	0, 1	0	0	1 pCi/yr	0
Rn222 progeny	Po210	0, 1	0	0	1 pCi/yr	0
	Pu238	0, 1	1.1E-6 Ci/yr	1.1E-8 Ci/yr	2.1E-8 Ci/yr	0
	Pu239	0, 1	8.6E-6 Ci/yr	1.99E-5 Ci/yr	4.2E-7 Ci/yr	2.4E-6 Ci/yr
	Am241	0, 1	7.1E-6 Ci/yr	3.79E-6 Ci/yr	4.2E-8 Ci/yr	0
	Am243	0, 1	0	0	7.4E-9 Ci/yr	0
Am243 progeny	Np239	0, 1	0	0	1 pCi/yr	0
			Enter same release rate for year 0 and year 1. Manually assign Bi212 release from Rn220.			

The Rn-220 progeny indicated in Table 3.5 (Pb-212 and Bi-212) indicate equilibrium levels. This was the practice for Pb-212 in Gv1.485 runs. Bi-212 equilibrium levels are entered in Gv2 runs as well, to ensure the Bi-212 dose to the receptor is conservative (i.e., overestimated). This change was implemented to assure the author that the radon model implemented Gv2 would sufficiently account for much of the radon dose. This practice is acknowledged to result in a highly overestimated Bi-212 intake and, subsequently, high overestimate of Bi-212 dose. If standards are being encroached upon by use of this high release assumption, more realistic Bi-212 release rates can be used (see Section 4.1).

The release point is entered in Cartesian coordinates in the Release Module as well as the Air Dispersion Module. Typically, as was done in these cases, the release points are entered as 0 km N and 0 km E. Then during the Environmental Uptake Module input, the receptor location is entered relative to the 0, 0 release point (tabulated in next section). Table 3.6 presents the Washington State Plane (WSP) coordinates for each of the Hanford atmospheric release points. These coordinate locations were used to determine the receptor offsets from each release point. (See Section 3.4 for exact values entered in the Gv2 Air Scenario Environmental Uptake module.)

Table 3.6. Washington State Plane Coordinates (m) for Hanford CY08 Atmospheric Release Locations

Release Point	Easting (m)	Northing (m)
100-K Area	568,640	146,440
200 Area	570,560	137,190
300 Area	594,528	115,396
400 Area	587,605	123,115

3.3 Air Dispersion Module Input

The Air Dispersion Module models transport of airborne effluents using the release-point-specific meteorological data provided by the user in the selected model. The output file provides arrays of nuclide-specific air concentration (Bq/m^3), dry atmospheric deposition rate ($Bq/m^2 \cdot s$), wet atmospheric deposition rate ($Bq/m^2 \cdot s$), and external dose (Sv) information for each radial direction and distance entered by the user. The same release point location used in Section 3.2 is used in the General Information input for this section (0,0). Eight air dispersion models are available in Gv2; Air Module-Chronic Plume is appropriate for the CY08 HAR scenarios and corresponds most closely to the chronic air dispersion model in Gv1.485. The same input is used for all exposure pathways (i.e., Food, Inhalation, and External). However, the meteorological data file is specific to each release point. Input values are provided in Table 3.7.

3.4 Environmental Uptake Module Input

Three major pathways were considered for the Sagemoor MEI Air scenarios:

- Ingestion of home-grown terrestrial foods.
- Inhalation.
- External exposure from the plume and ground deposition.

The Environmental Uptake Module input is where the receptor location is first entered. The receptor of interest for the CY08 evaluations is Sagemoor. The Washington State Plane coordinates for Sagemoor and other historic receptor locations are shown in Table 3.6. Since the release points were entered as 0 km E and 0 km N, the receptor locations in the Air Release cases were entered relative to the (0,0) release points. Table 3.8 provides the receptor locations relative to the release points for the Sagemoor MEI, as well as other Hanford receptor locations.

The Environmental Uptake Module input requires a variable number of input parameters, depending on the pathway under evaluation. The Environmental Uptake Module output provides radionuclide concentrations in food products consumed by the MEI. The most extensive input is required for the Terrestrial Food pathway with its various crops (leafy vegetables, root vegetables, fruit, grain, animal feed, and animal forage) and animal products (meat, eggs, milk, poultry). The complete set of inputs is presented first (Section 3.4.1). Later sections (Section 3.4.2 for the Inhalation pathway and Section 3.4.3 for the External Exposure pathway) present only the inputs that differ from those presented in Section 3.4.1.

Table 3.7. Air Scenario Chronic Plume Dispersion Module Input

Gv2 Variable	Description	Major tab: / Minor tab: Units	Model Information: Radial Grid Definition	Model Information: Model Parameters	Model Information: Default Parameters	Model Information: Meteorological Files	Source Information: Source n	G1.485 Data Source
ARRADVAL	Radial Distance	m	per default.in file[a]					DEFAULT. in file
ARNUMRECRING	Sectors in radial grid	sectors	16					<default>
ARSIGPARM	Sigma Parameterization Usage	N/A		Pasquill-Gifford (NRC)				
ARCALMDISTFLAG	Use user's supplied calm wind distribution	N/A		N/A				
ARCALMDIST	Calm Wind Distribution	fraction		N/A				
ARMINRISESPD	Minimum wind speed during plume rise	m/s			1.5 m/s			use default
ARMINSIGYSHIFT	Sigma to shift to semi-infinite cloud shine	m			400 m			use default
ARTRANSRESIST	Transfer resistance	s/m			10 s/m (iodine) 100 s/m (particle)			use default
ARMINWIND	Maximum wind speed for 'calm'	m/s			0.8 m/s			use default
ARMETFILE	Path and Name of Meteoro-logical Data File	N/A				Han08100K10.met Han08200H89.met Han0830010.met Han0840010.met		Varies by release point.
ARCLDSHNLIB	Path and Name of Cloud Shine Library	N/A				CSHNLIB.dat		use default
ARSRCDORISEFLAG	Do Plume Rise	N/A					X	
ARSRCDODISPFLAG	Use Enhanced Dispersion	N/A					N/A	

(a) Radial distances in m = 805, 2414, 4023, 5632, 7241, 12068, 24135, 40255, 56315, 72405.

Table 3.8. Locations Relative to Air Release Points

	Sagemoor Receptor		Riverview Receptor		Ringold Receptor	
Release Point	km E of Release	km N of Release	km E of Release	km N of Release	km E of Release	km N of Release
100 Area	27.056	-30.424	30.093	-43.253	27.217	-17.576
200 Area	25.136	-21.174	28.173	-34.003	25.297	-8.326
300 Area	1.168	0.62	4.205	-12.209	1.329	13.468
400 Area	8.091	-7.099	11.128	-19.928	8.252	5.749

3.4.1 Food-Terrestrial

The Terrestrial Food pathway evaluates intakes of radionuclides via consumption of leafy vegetables, root vegetables, fruit, grain, meat, eggs, milk and poultry following atmospheric deposition. The inhalation path is checked for this pathway, so that air concentrations will be presented in the output file. Input values are provided in Table 3.9 and Table 3.10.

3.4.2 Inhalation

The Inhalation pathway evaluated intakes of radionuclides in air, assuming the receptor was outdoors full time. Table 3.11 provides only those input values that differ from those presented in Table 3.9 for the Terrestrial Food pathway. Many of the parameters from the terrestrial pathway were not reset to zero because the pathway flag was turned off. Input for inactive pathways is disregarded by the software.

3.4.3 External Exposure

The External Exposure pathway for the Air scenarios consists of external exposure from the passing infinite plume and nuclides deposited on the soil surface. Table 3.12 presents only those Environmental Uptake module input values which differ from that of the Terrestrial Food pathway input of Table 3.9. The Table 3.12 data entries are limited to only identifying the pathway of interest.

3.5 Receptor Intake Module Input

The Receptor Intake Module uses the radioactive material concentrations calculated in the Environmental Uptake Module, assigns intake or exposure rates, and provides receptor intake rates of each nuclide from the environmental media as output. Due to its large number of intake categories, the Terrestrial Food pathway requires the most extensive input. As with the Environmental Uptake Module, if the pathway is turned off, parameter values related to non-relevant pathways were not reset to zero. Gv2 can consider a number of age groups. However, Gv1.485 calculates results for a single age group, so a single comparable group (20–70 yrs old) was evaluated in Gv2.

3.5.1 Terrestrial

Table 3.13 provides parameter values used in the Receptor Intake Module for the Terrestrial Food pathway. The usual suite of vegetation (leafy, root, fruit, and grain) and animal products (meat, poultry, eggs, and milk) were considered.

3.5.2 Inhalation and External Exposure

The intake and exposure rates for the remaining Inhalation and External Exposure pathways are provided together in Table 3.14, presenting only the differences from those of the Terrestrial Food input (Table 3.13). Parameter values for Terrestrial Food input were not reset to zero when the pathway was not marked for consideration in the Environmental Uptake module.

Table 3.9. Chronic Exposure Module – Air Scenario Terrestrial Food Input[1]

Gv2 Variable	Description	Major tab: / Minor tab: / Units	Controls <one>	Soil <mult>	Agric. General	Agric. Animal Feed/mult.	Agric. Food Crop/mult.	Agric. Intake Delays	Pathways <one>	G1.485 Data Source
ANFOOD	Animal product ingestion	N/A	X							input file
TFOOD	Terrestrial food crop ingestion	N/A	X							input file
AQFOOD	Aquatic food ingestion	N/A	N/A							
RECRE	Recreational surface water	N/A	N/A							
DEBUG	Debug testing	N/A	N/A							
NTKEND	Duration of exposure period	yr	1							input file
RELEND	End of release period	yr	1							input file
BEFORE	Time from start to exposure	yr	0							input file
ABSHUM	Absolute humidity, used only for tritium model	kg/m3	0.008							DEFAULT.IN
RF1	Fraction of plants roots in surface soil	fraction	1							<undefined in Gv1.485>
RAIN	Average daily rain rate	mm/d	0.01							<not used in Gv1.485; 0 not accepted>
BEFAIR	Air deposition time prior to exposure	yr	0							
LEACHOPTION	Type of leach rate constant	N/A		GENII default leach rates						<FTRANS.dat>
IRES	Type of resuspension model	N/A		No resusp						<no inhalation intakes>
SLDN	Surface soil areal density	kg/m2		224 kg/m2						DEFAULT.IN
SURCM	Surface soil layer thickness used for density	cm		15 cm						DEFAULT.IN
SSLDN	Surface soil density	kg/m3		1500 kg/m3						DEFAULT.IN
HARVST	Radionuclide removal due to harvesting	N/A			X					<Not implemented for one-yr release, but activate anyway>
DRYSET	User defined dry deposition interception fraction to plants	N/A			N/A					
DEPFR1	Dry deposition retention fraction to plants	fraction			N/A					
WETSET	User defined wet deposition interception fraction to plants	N/A			X					<default>
DEPFR2	Wet deposition retention fraction to plant surfaces	fraction			0.25					DEFAULT.IN
LEAFRS	Resuspension factor from soil to plant surfaces	1/m			0.000000001					DEFAULT.IN
DPVRES	Deposistion velocity from soil to plant surfaces	m/s			0.001					DEFAULT.IN
WTIM	Weathering rate constant from plants	d			14 d					DEFAULT.IN

[1] See Table 3.10 when "See FdFrLabel," "See TFDLabel," and "See ANFLabel" is indicated.

Table 3.9. (contd)

Gv2 Variable	Description	Major tab: / Minor tab: / Units	Controls <one>	Soil <mult>	Agric. General	Agric. Animal Feed/mult.	Agric. Food Crop/mult.	Agric. Intake Delays	Pathways <one>	G1.485 Data Source
WTIM	Weathering rate constant from plants	d			14 d					DEFAULT.IN
BIOMA2	Standing animal feed biomass (wet)	kg/m2				See FdFrLabel				DEFAULT.IN
CONSUM	Consumption rate	kg/d				See FdFrLabel				DEFAULT.IN
STORTM	Storage time	day				See FdFrLabel				input file
DIETFR	Fraction of diet	fraction				See FdFrLabel				input file
GRWPA	Animal feed growing period	day				See FdFrLabel				input file
YELDA	Yield for animal feed	kg/m2				See FdFrLabel				input file
DRYFA2	Animal feed dry/wet ratio	fraction				See FdFrLabel				DEFAULT.IN
TRANSA	Translocation factor for animal feed	fraction				See FdFrLabel				DEFAULT.IN
SLCONA	Animal daily soil consumption rate	kg/d				See FdFrLabel				<not in Gv1.485>
BIOMAS	Standing biomass (wet)	kg/m2					See TFDLabel			DEFAULT.IN
GRWP	Growing period	day					See TFDLabel			input file
YELD	Yield	kg/m2					See TFDLabel			input file
DRYFAC	Dry/wet ratio	fraction					See TFDLabel			DEFAULT.IN
TRANS	Translocation factor	fraction					See TFDLabel			DEFAULT.IN
HLDUP	Time from harvest to ingestion	day						See TFDLabel		input file
HLDUPA	Time from harvest to animal ingestion	day						See ANFlabel		input file
HLDUP2	Time from harvest to ingestion	day						N/A		
ANF	Meat Ingestion pathway	N/A							See ANFlabel	input file
TFD	Veg Ingestion pathway	N/A							See TFDLabel	input file
AQF	Aqu Ingestion pathway	N/A							N/A	
DRINK	Drinking water	N/A							N/A	
SHING	Inadvertent shower water	N/A							N/A	
SWING	Inadvertent swimming water	N/A							N/A	
SLING	Inadvertent soil	N/A							N/A	
INHAL	Inhalation of Outdoor Air	0							X	input file
SHINDR	Inhalation of Indoor Air	0							N/A	
SLINH	Suspended or resuspended soil	N/A							N/A	
SHINDR	Indoor or showering	N/A							N/A	
REC	External pathway	N/A							N/A	
REC(1)	Swimming External	N/A							N/A	
REC(2)	Boating External	N/A							N/A	
REC(3)	Shoreline External	N/A							N/A	
GROUND	Soil external	N/A							N/A	
AIREXT	External air	N/A							N/A	
FINITE	Finite plume model	N/A							N/A	

Table 3.10. Additional Information for Air Scenario Terrestrial Food Pathway Input of Table 3.9 (FdFrLabel, ANFLabel, and TFDLabel Input)

				FdFrLabel						ANFLabel (food eaten by receptor)				TFDLabel			
Gv2 Variable	Description	Units	GI.485 Data Source	Meat-feed	Poultry-feed	Milk-feed	Egg-feed	Meat-forage	Milk-forage	Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain
BIOMA2	Standing animal feed biomass (wet)	kg/m2	DEFAULT.IN	0.8	0.8	1	0.8	1	1.5								
CONSUM	Consumption rate	kg/d	DEFAULT.IN	68	0.12	55	0.12	68	55								
STORTM	Storage time	day	input file	180	180	100	180	100	0								
DIETFR	Fraction of diet	fraction	input file	0.25	1	0.25	1	0.75	0.75								
GRWPA	Animal feed growing period	day	input file	90	90	45	90	45	30								
YELDA	Yield for animal feed	kg/m2	input file	0.8	0.8	2	0.8	2	1.5								
DRYFA2	Animal feed dry/wet ratio	fraction	DEFAULT.IN	0.18	0.18	0.18	0.18	0.2	0.2								
TRANSA	Translocation factor for animal feed	fraction	DEFAULT.IN	0.1	0.1	0.1	0.1	1	1								
SLCONA	Animal daily soil consumption rate	kg/d	<not in Gv1.485>	0	0	0	0	0	0								
BIOMAS	Standing biomass (wet)	kg/m2	DEFAULT.IN											2	2	3	0.8
GRWP	Growing period	day	input file											90	90	90	90
YELD	Yield	kg/m2	input file											1.5	4	2	0.8
DRYFAC	Dry/wet ratio	fraction	DEFAULT.IN											0.1	0.25	0.18	0.18
TRANS	Translocation factor	fraction	DEFAULT.IN											1	0.1	0.1	0.1
HLDUP	Time from harvest to ingestion	day	input file											1	5	5	180
HLDUPA	Time from harvest to animal ingestion	day	input file							15	1	1	1				
ANF	Meat Ingestion pathway	N/A	input file							X	X	X	X				
TFD	Veg Ingestion pathway	N/A	input file											X	X	X	X

Table 3.11. Chronic Exposure Module-Air Inhalation Input (differences only from those in Table 3.9 and Table 3.10)

		Major tab:	Controls	Pathways	
		Minor tab:	<one>	<one>	G1.485 Data
Variable	Description	Units			Source
ANFOOD	Animal product ingestion	N/A	N/A		input file
TFOOD	Terrestrial food crop ingestion	N/A	N/A		input file
ANF	Meat Ingestion pathway	N/A		N/A	input file
TFD	Vegetable Ingestion pathway	N/A		N/A	input file

Table 3.12. Chronic Exposure Module Air Scenario External Exposure Input (differences only from those in Table 3.9 and Table 3.10)

		Major tab:	Controls	Pathways	
		Minor tab:	<one>	<one>	G1.485 Data
Variable	Description	Units			Source
ANFOOD	Animal product ingestion	N/A	N/A		input file
TFOOD	Terrestrial food crop ingestion	N/A	N/A		input file
INHAL	Inhalation of Outdoor Air	0		N/A	input file
GROUND	Soil external	N/A		X	input file
AIREXT	External air	N/A		X	input file

3.6 Health Impact Module Input

The Health Impact Module input is the same for the Surface Water and Air scenarios (see Table 2.11, Section 2.6 for Health Impact Module inputs). The method selected is the first option, "Calculate radiation dose and risk using ICRP 30/48 factors (Federal Guidance Reports 11/12)." The Method Parameters indicates selection of the committed effective dose equivalent (CEDE). For scenarios with External Exposure pathways, the soil thickness and density must match those entered in the Environmental Uptake module. The cancer conversion factors are not used for this analysis.

Table 3.13. Receptor Intake Module Air Scenario Terrestrial Food Input

				ANFLabel (food eaten by receptor)				TFDLabel				AQFLabel				
Gv2 Variable	Description	Pathway Selection	Value	Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Molluscs	Crustacea	Aquatic Plants	Gv1.485 Data Source
NAGES	Number of age groups	One entry all Pathway selections	1													<default>
LOWAGE	Lower ager limit	One entry all Pathway selections	20 y													adult age group default
UPAGE	Upper age limit	One entry all Pathway selections	70 y													adult age group
UEXAIR	Daily plume immersion exposure time	External exposure to air	0 hr													input file
TEXAIR	Yearly plume immersion exposure time	External exposure to air	365 d/y													input file
SHIN	Indoor shielding factor	External ground exposure	1													no dose reduction
SHOUT	Outdoor shielding factor	External ground exposure	1													no dose reduction
UEXGRD	Daily external ground exposure time	External ground exposure	12 hr/d													input file (4380 hr/yr)
TEXGRD	Yearly external ground exposure time	External ground exposure	365 d/y													<default>
FTIN	Fraction of time spent indoors	External ground exposure	0													<default>
FTOUT	Fraction of time spent outdoors	External ground exposure	0													input file
EVSWIM	Frequency of swimming event	External exposure while swimming; Water ingestion while swimming	0 event/d													N/A
TESWIM	Duration of swimming event	External exposure while swimming; Water	0 hr													N/A
TSWIM	Swimming days	External exposure while swimming; Water ingestion while swimming	50 d/y													N/A
USWIM	Ingestion rate of water while	External exposure while swimming; Water	0 L/h													N/A
SFBOAT	Shielding factor	External exposure while boating	1													N/A
EVBOAT	Frequency of boating event	External exposure while boating	0 event/d													N/A
TEBOAT	Duration of boating event	External exposure while boating	0 hr													N/A
TBOAT	Boating days	External exposure while boating	50 d/y													N/A
EVSHOR	Frequency of shoreline use	External exposure to shoreline	0 event/d													N/A
TESHOR	Duration of shoreline use events	External exposure to shoreline	0 hr													N/A
TSHOR	Shoreline days	External exposure to shoreline	100 d													N/A
SWFAC	Shoreline width factor	External exposure to shoreline	0.2													N/A
UCRP	Crop consumption rate	Food crop ingestion	See TFDLabel					30 kg/y	220 kg/y	330 kg/y	80 kg/y					input file
TCRP	Crop consumption period	Food crop ingestion	See TFDLabel					365 d	365 d	365 d	365 d					<default>
UANM	Animal product consumption rate	Animal product ingestion	See ANFLabel	80 kg/y	18 kg/y	270 kg/y	30 kg/y									input file
TANM	Animal product consumption period	Animal product ingestion	See ANFLabel	365 d	365 d	365 d	365 d									<default>
UAQU	Aquatic food consumption rate	Aquatic food ingestion	See AQFLabel													N/A

Table 3.13. (contd)

Gv2 Variable	Description	Pathway Selection	Value	ANFLabel (food eaten by receptor)				TFDLabel				AQFLabel				Gv1.485 Data Source
				Meat	Poultry	Milk	Egg	Leafy Veg	Root	Fruit	Grain	Fish	Mollusca	Crusacea	Aquatic Plants	
TAQU	Fish consumption period	Aquatic food ingestion	See AQFLabel									365 d	365 d	365 d	365 d	N/A
UDW	Drinking water ingestion rate	Drinking water ingestion	0 L/d													input file
TDW	Drinking water ingestion period	Drinking water ingestion	365 d/y													input file
EVSHWR	Freqency of showering event	Water ingestion while showering	0 event/d													N/A
TESHWR	Duration of showering event	Water ingestion while showering	0 hr													input file
TSHWR	Showering days	Water ingestion while showering	365 d													N/A
USHIN	Ingestion rate of water while showering	Water ingestion while showering	0													N/A
TSOIL	Soil contact days	Inadvertent soil ingestion	365 d													N/A
USOIL	Inadvertent soil ingestion rate	Inadvertent soil ingestion	0 mg/d													input file
UINH	Air inhalation rate	Air inhalation	0 cm3/s													N/A
TINH	Air inhalation period	Air inhalation	365 d/y													N/A
FRINH	Fraction of a day indoor inhalation occurs	Air Inhalation	1													N/A
UINHR	Resuspended soil inhalation rate	Resuspended soil inhalation	0 m3/d													input file
TINHR	Resuspended soil inhalation period	Resuspended soil inhalation	365 d/y													N/A
FRINHR	Fraction of a day inhalation occurs	Resuspended soil inhalation	1													N/A
UINDRH	Indoor air inhalation rate	Indoor air inhalation	22 m3/d													N/A
TINDRH	Indoor air inhalation period	Indoor air inhalation	365 d													N/A
FRINDR	Fraction of a day indoor inhalation occurs	Indoor air inhalation	0													N/A

Table 3.14. Receptor Intake Module – Air Scenario Inhalation and External Exposure Input (differences only from those in Table 3.13)

Gv2 Variable	Description	Pathway Selection	Value	Gv1.485 Data Source
For Air Inhalation Pathway				
UINH	Air inhalation rate	Air inhalation	270 cm^3/s	default.in
For Air Scenario External Exposure Pathway				
UEXAIR	Daily plume immersion exposure time	External exposure to air	24 h	input file
FTOUT	Fraction of time spent outdoors	External ground exposure	1	input file

4.0 Comparing HAR CY08 GENIIv1.485 Results to Mimicked GENIIv2 Results

The Water and Air scenario calculations were performed using GENIIv2 with models and input set to mimic, to the extent possible, the evaluations performed using GENIIv1.485 for the Sagemoor MEI in the Hanford Site Annual Environmental Report for CY08 (Poston et al. 2009). Table 4.1 indicates the Gv1.485 results used for comparison. Table 4.2 indicates the Gv2 results calculated using the input described in Chapters 3 and 4.

Table 4.1. CY08 Hanford Site GENII v1.485 Dose Results Grand Summary (mrem)

	Release Location					% Total Dose by	% Total Dose All
Pathway	100 Area	200 Area	300 Area	400 Area	Total	Pathway	Pathways
AIR							
External	2.8E-10	3.1E-07	5.3E-04	2.6E-08	**5.3E-04**	1%	1.2%
Inhalation	2.3E-05	3.5E-05	7.5E-03	1.5E-05	**7.5E-03**	18%	17%
Terr. Foods	6.5E-07	2.3E-04	3.2E-02	5.3E-07	**3.3E-02**	80%	73%
Subtotal Air	2.4E-05	2.7E-04	4.0E-02	1.6E-05	**4.1E-02**	100%	90.5%
WATER							
Recreation	1.3E-09	3.6E-05	0	0	**3.6E-05**	1%	0.08%
Terr. Foods	6.6E-07	2.2E-03	0	0	**2.2E-03**	53%	5.0%
Aqu. Food	5.7E-07	2.0E-03	0	0	**2.0E-03**	46%	4.4%
Subtotal Water	1.2E-06	4.3E-03	0.0E+00	0.0E+00	**4.3E-03**	100%	9.5%
Total	**2.5E-05**	**4.5E-03**	**4.0E-02**	**1.6E-05**	**4.5E-02**		**100%**

Table 4.2. CY08 Hanford Site GENII v2 Dose Results Grand Summary (mrem)

	Release Location					% Total Dose by	% Total Dose All
Pathway	100 Area	200 Area	300 Area	400 Area	Total	Pathway	Pathways
AIR							
External	2.2E-10	1.4E-07	9.3E-04	2.9E-08	**9.3E-04**	2%	1.8%
Inhalation	2.0E-05	1.2E-04	1.2E-02	1.3E-05	**1.2E-02**	26%	24%
Terr. Foods	1.0E-06	1.1E-04	3.3E-02	6.5E-07	**3.3E-02**	72%	66%
Subtotal Air	2.1E-05	2.3E-04	4.6E-02	1.4E-05	**4.6E-02**	100%	91.8%
WATER							
Recreation	1.4E-09	3.3E-05	0	0	**3.3E-05**	0.8%	0.07%
Terr. Foods	6.0E-07	2.1E-03	0	0	**2.1E-03**	50%	4.1%
Aqu. Food	6.7E-07	2.0E-03	0	0	**2.0E-03**	49%	4.0%
Subtotal Water	1.3E-06	4.1E-03	0.0E+00	0.0E+00	**4.1E-03**	100%	8.2%
Total	**2.2E-05**	**4.4E-03**	**4.6E-02**	**1.4E-05**	**5.0E-02**		**100%**

The ratio of the Gv2:Gv1.485 was calculated to provide a simple visual comparison of these summary results (see Table 4.3). For the mix of nuclides released and their release locations relative to the Sagemoor receptor, the resulting total dose from all pathways is 12% higher using Gv2 compared to Gv1.485. This is well within the factor of 10 uncertainty that would be expected from any environmental model comparison. The dose ratios vary from approximately one-half to more than three times for individual pathway and release locations. The reasons for these variations are discussed in this section. The greatest differences result from several factors: Gv2 changes in the tritium model, more realistic accounting of plume depletion for airborne releases, as well as the report author's implementation of radionuclide decay chains within the radon model of Gv2.

Table 4.3. Ratio of Hanford Site CY08 Gv2 Dose to Gv1.485 Dose (ratio **Table 4.2**:**Table 4.1**values) (unitless)

	Release Location					Ratio of: % Total Dose by Pathway
Pathway	100 Area	200 Area	300 Area	400 Area	**Total**	
AIR						
External	0.79	0.46	1.76	1.12	**1.75**	1.55
Inhalation	0.86	3.24	1.59	0.88	**1.59**	1.41
Terr. Foods	1.58	0.48	1.02	1.23	**1.01**	0.90
Subtotal Air	0.88	0.84	1.13	0.89	**1.13**	
WATER						
Recreation	1.08	0.92			**0.92**	0.94
Terr. Foods	0.92	0.93			**0.93**	0.95
Aqu. Food	1.18	1.02			**1.02**	1.05
Subtotal Water	1.04	0.97			**0.97**	
Total	**0.89**	**0.96**	**1.13**	**0.89**	**1.12**	

For those interested in the details, extensive tables of results are available in Appendix A for the Surface Water scenario and Appendix B for the Air scenario. The results include water and air nuclide concentrations at the receptor location for the Surface Water and Air scenarios, respectively (summarized in Section 4.2), as well as pathway-specific intake (or exposure) rates and dose (summarized in Section 4.3). Due to the numerous input parameters and modeling specific to each terrestrial food type (e.g., air deposition to leafy plants to cow ingestion to human milk ingestion), intake and dose results in the appendices are broken out for each food type. Not all the results presented in the appendices are discussed, but the data are tabulated, there, for completeness.

4.1 Comparison Point – Overall Dose Results

The total dose results rounded to one significant figure are equivalent for the combined Water and Air scenarios in Gv1.485 and Gv2 (0.05 mrem/y). Results for the Surface Water scenarios are also essentially the same (0.004 mrem/y). However, for the Air scenarios, the Gv2 dose is slightly higher at 0.05 mrem/y compared to the Gv1.458 dose of 0.04 mrem/y. This is a small absolute difference (1E-05 rem), but does represent a minor increase (by 12%) in the estimated dose. The significance of the dose difference is equivocal because it is well below the dose of regulatory concern.

This report has identified a problem with the Gv2 handling of implicit progeny in the radon decay chain calculations when ICRP30/48 factors are implemented, which impacts both Rn-220 and Rn-222 results. The issue has been reported to the code developer and is to be corrected during a future revision to the Gv2 code. The issue relates to the appropriate incorporation of very short-lived radon progeny doses. The future revision would either implement a revised radon-specific model or revise the radon chain dose-conversion factors to improve implicit progeny dose reporting. A workaround was attempted by the author, as described, below, but does not fully or ideally estimate radon dose. Therefore, the radon model of Gv2, revision 2.08[1], should be acknowledged to be in need of improvement.

The 300 Area releases account for most of the Sagemoor receptor dose with inhalation dose differences between the codes causing the greatest increase. The 300 Area release External pathway; 200 Area Inhalation pathway; and 100 Area Terrestrial Food pathway all have larger Gv2:Gv1.485 dose ratios (see Table 4.3), but their contributions to the total dose are insignificant in comparison to the 300 Area-release Inhalation dose (see Table 4.1 and Table 4.2). The difference in the 300 Area-release inhalation dose results from a doubling of the reported dose from Rn-220+progeny (Pb-212 and Bi-212) in Gv2 (9.2E-3 mrem Gv2 and 4.1E-3 mrem Gv1.485) (see Appendix B, Section B.6.2). Rn-220 doses are further discussed in more detail because of its impact to the final dose estimates.

The increase in the 300 Area inhalation dose for Bi-212 accounts for the virtually the entire absolute difference in the dose from Gv1.485 to Gv2. As indicated in Section 3.2, the Bi-212 dose of Gv2 is acknowledged to be highly overestimated. The additional Bi-212 included in Gv2 cases would be expected to result in higher doses than that of Gv1.485 for this nuclide. In order to more realistically calculate the Bi-212 intake at the receptor location in Gv2, one could determine the average atmospheric transport time from the release point to the receptor, determine ingrowth of Bi-212 during transport, then determine what Bi-212 release would hypothetically occur at the release point in order to have the more realistic Bi-212 activity at the receptor location. As indicated earlier, this would only need to be done if the over-estimated dose results require more accuracy.

The Gv2 model does explicitly include dose from some radon progeny with half-lives less than 9 hours in the parent dose factors. Bi-212 has a half-life of 60.6 min. Therefore, for the most part, the Gv2 Bi-212 dose contribution is included in the dose factors of its immediate parent (Pb-212). This is referred to as implicit consideration of progeny dose within the parent dose. However, not all of the short-lived progeny are implicitly accounted for.

As an additional measure of Rn-220 dose comparison the author compared Rn-220 dose results for all pathways with that from the U.S. Environmental Protection Agency's CAP88PCv3 (Rosnick 2007) air pathway code. The Gv2 results compare well with the CAP88PCv3 Rn-220 dose results (see Table 4.4).

Table 4.4. Rn-220 Dose Results from Three Codes

Code	Rn220+progeny Dose (mrem)
CAP88PCv3	0.013
Gv1.485	0.0042
Gv2	0.0096

[1] This same radon model is included in the most current GENII v2.09, as well.

Given these results and knowledge that Gv2 does not implement all implicit progeny (nor working level considerations for radon-222) in the radon calculations, but provides a more simplified algorithm, one might consider using CAP88PC results for radon doses.

4.2 Comparison Point: Media Concentration at Sagemoor

Once a radionuclide is released, the environmental models mathematically estimate dispersion of the release to calculate the water and air concentrations at the receptor location – in this case at Sagemoor. Differences in the water and air concentrations that each code computes are discussed along with their subsequent impact to the Sagemoor MEI dose. Data sources used for comparison are indicated in Table 4.5. Unit conversions were performed to readily compare the data, as presented in Appendices A and B.

Table 4.5. Air and Water Concentration Data at Receptor Location

	Source Data Use for Comparison		
Scenario	GENII v1.485	GENII v2	Data Tables
Surface Water	Media.out file	*.WCF file	See Appendix A, Section A.1
Air	ChiQ.IN value · release rate	*.ATO file	See Appendix B, Section B.1

The water concentrations determined by each GENII version were compared in the Surface Water scenarios. For the set of nuclides released from the 100 and 200 Areas, the water concentrations at Sagemoor were within 3% of each other for all nuclides except the second and final progeny of U-238, Pa-234 (see Appendix A, Section A.1). The Pa-234 concentrations in Gv2 were many orders of magnitude *below* those estimated by Gv1.485, however. The greatest impact of this result for Surface Water scenario is for the irrigated soil dose within the Terrestrial Food pathway (see Appendix A, Sections A.2.3 and A.6). The Pa-234 dose is a small but significant contributor to the Gv1.485 irrigated soil doses and its dose contribution is small compared to the total for the Terrestrial and Aquatic Food pathways (see Appendix A, Section A.6). In Gv2, the Pa-234 dose is implicitly included in the Th-234 external dose. Additionally, for the Sagemoor Surface Water scenario, the dose from ingestion of food is 2 orders of magnitude greater than the dose from irrigated-soil-external-exposure. Therefore, for the scenario of concern, the difference in the Gv1.485 and Gv2 Pa-234 water concentrations can be diregarded.

The Air scenario results are more complex because of the wider array of nuclides and variety of distances from the release point to the Sagemoor receptor. The Sagemoor air concentrations (see Appendix B, SectionB.1) are, generally:

- 15% lower in Gv2 for 100 Area and 400 Area releases
- 10% higher in Gv2 for 300 Area releases
- 330% higher in Gv2 for 200 Area releases.

These are said to be "generally" true primarily because Y-90 air concentrations do not fit the generalization for the 100 and 200 Area release points. This is a consequence of the fact that the Gv1.485

air concentration presented do not provide ingrowth concentrations for progeny. Little ingrowth occurs from the 300 Area Sr-90 release, resulting in a better Gv1.485 and Gv2 air concentration match. Ingrowth in Gv1.485 is accounted for once environmental media concentrations are computed, therefore the noted difference in progeny air concentrations is corrected "downstream."

The differences in overall air concentrations, where air concentration ratios range from 0.84 to 3.3, follow trends that are readily explainable by known differences in the air dispersion modeling of Gv2 and Gv1.485. Two major differences are the type of meteorological data input used by each code and taking plume depletion into account in Gv2 in order to preserve mass balance.

Gv2 uses hourly meteorological data, whereas Gv1.485 uses a 16×56 data array of annual average joint frequency data. The meteorological data used in the Gv2 for this report were modifications of the Gv1.485 joint frequency array file (a utility available in Gv2), rather than actual hourly Hanford Site data.

Another meteorological model difference is that the Gv1.485 atmospheric ceiling height was held at a constant elevation (1000 m), whereas the ceiling height was varied hourly in Gv2. This results in a net increase in air concentrations in Gv2 because the release mixes with a lower atmospheric volume, as a result of the lower ceiling heights used in Gv2 calculations. Whether the hourly meteorological data format represents an improvement over an annual average dispersion estimate is not known, but Gv2 provides for modeling of more realistic conditions. In any case, a difference in the dispersion estimates for the two models would be expected. As an additional caveat, ceiling heights below release heights create a non-deposition of the plume at ground level. This is significant for 200 Area releases, which are assumed to occur at 89 m. All other release heights are 10 m.

The other difference in the air dispersion models of the two codes is the implementation of mass balance in Gv2 resulting in a net decrease in the airborne radionuclide concentrations. In Gv1.485, the material assumed to deposit on the ground is not mathematically depleted from the plume; therefore downstream environmental media concentrations are overestimated, resulting in conservative (likely overestimates) of receptor dose. In Gv2, the downstream air concentration estimates account for plume depletion, resulting in lower concentrations of nuclides being transported at longer distances by the plume (relative to the Gv1.485 model).

The relative significance of the change in meteorological input (with the dispersion model changes and ceiling height changes) and the change to account for mass balance of the releases is variable and not readily predictable. Whether it would increase or decrease the air concentration would not be readily predicable and would depend on the type and form of the radionuclide, release height, and distance to the receptor.

Another option available in Gv2 is to model releases as both particulates and gases. These options were not implemented in the code comparisons, but would generally tend to decrease MEI doses as a result of non-reactive gas modeling and depletion of reactive gases from the plume before it reached a distant MEI.

4.3 Comparison Point: Receptor Intake/Exposure and Dose

Section 4.2, which compares the initial radionuclide concentrations in contaminating media (surface water or air) at the receptor location, discusses Gv2 and Gv1.485 differences in the dispersion models for

Surface Water and Air scenarios. To evaluate the differences in the secondary environmental media (entrainment in soil, vegetation, and food sources), intake and exposure levels estimated by the two codes are compared. The modeled intake rates (or exposure levels) take into account transfer of the nuclides from water or air to the secondary media, hold-up times, and consumption rates (or exposure time) by the receptor. The files used to obtain data for intake or exposure comparison between the GENII codes are indicated in Table 4.6. Unit conversions were performed to facilitate comparison of the data, as presented in Appendices A and B.

The Gv2 and Gv1.485 comparative dose results by nuclide and pathway are also discussed in this Section, since they generally correspond to the Intake/Exposure comparisons. The files used to obtain data for dose comparisons between the GENII codes are indicated in Table 4.7. Unit conversions were performed to facilitate comparison of the data, as presented in Appendices A and B.

Table 4.6. Intake/Exposure Data Used for Comparisons

	Source Data Use for Comparison		
Scenario	GENII v1.485	GENII v2	Data Tables
Surface Water	ENV.OUT[(a)]	*.RIF files	Terrestrial Food – see Appendix A, Section A.2.1 Aquatic Food – see Appendix A, Section A.3 Recreation– see Appendix A, Section A.4.1
Air	Inhalation: ENV.OUT External plume: Media.OUT[(b)] External ground: ENV.OUT Terrestrial Food: ENV.OUT	*.RIF files	Terrestrial Food – see Appendix B, Section B.2 Inhalation – see Appendix B, Section B.3 External Exposure – see Appendix B, Section B.4

(a) The Gv1.485 ENV.OUT file lists the units for shore sediment data incorrectly as pCi/L. Units are actually pCi/m^2.

(b) Air concentrations for plume exposure are weighted to account for exposure time and, as a result, may differ from initial air concentrations discussed in Section 4.2.

Table 4.7. Dose Data at Receptor Location

Scenario	Source Data Use for Comparison		Data Tables
	GENII v1.485[(a)]	GENII v2	
Surface Water	<pathway>.OUT	*.HIF files	Terrestrial Food – see Appendix A, Section A.2.2 Aquatic Food – see Appendix A, Section A.2 Recreation – see Appendix A, Section A.4.2 All SW scenarios – see Appendix A, Section A.6
Air	<pathway>.OUT	*.HIF files	Terrestrial Food – see Appendix B, Section B.1 Inhalation – see Appendix B, Section B.3 External Exposure – see Appendix B, Section B.4 All Air scenarios – see Appendix B, Section B.6

(a) The Gv1.485 *.OUT files combine the parent and progeny doses. When they are readily separated by nuclide for a pathway, this is reflected in the Appendix tables.

4.3.1 Surface Water Scenario Intake/Exposure and Subsequent Dose

Surface Water scenario intakes from aquatic food ingestion (see Appendix A, Section A.3) follow the same general trends as the water concentrations. Some Gv2 intakes from fish consumption are significantly higher (Y-90 30% higher and Th-234 90% higher) but because the resulting dose from these routes is small relative to the total aquatic food dose, the impacts are not significant for the Sagemoor receptor. The Gv2 Terrestrial Food intakes (Appendix A, Section A.2) are generally lower (80% overall average for both vegetation and animal product categories). Of passing interest is that the tritium and Sr-90 intakes from roots and fruits are 10% to 20% lower than that of the leafy vegetable. Note that since the grain is not irrigated, it results in no intake for any nuclide (Appendix A, Section A.2). The heavy metal (Th, U, and Pu) intake ratios are comparable across all other food categories.

Tritium intake ratios do not follow the same pattern as for other radionuclides because the tritium model was completely revised in Gv2. Therefore, food pathway intake differences between the two versions cannot be attributed to specific changes, but reflect fundamental differences in the models. For Surface Water scenarios, the net tritium dose results are comparable with an approximately 15% decrease in the Gv2 dose.

There is an issue with the Gv2 tritium model implementation of contaminated water ingestion for animals, notably poultry and eggs in this presentation, which requires expanded discussion as it is not currently explained in the Gv2 documentation. The grain on which these animals feed on is not irrigated. Therefore, their only source of tritium intake is surface water ingestion. However, the Gv2 special tritium model code has a peculiarity. Although the "Contaminated fraction of water for egg animal" and "...poultry animal" is set to 1.0, it has no impact for the current Gv2 tritium model of egg and poultry water intake. Contaminated water intakes for the other nuclides are implemented appropriately for egg and poultry. For the sake of simplicity, the atypical result was not revised, since subsequent egg and poultry doses are not significant relative to total terrestrial food doses from Surface Water scenarios for all nuclides. For dose evaluations with a strong tritium component and exclusive evaluation of Terrestrial Food pathways, the user would need to select an irrigation water source for animal feed, and then set the irrigation rate to 0 inches/yr for non-irrigated crops; this procedure would activate tritium water intakes for the animals.

The Surface Water Terrestrial Food pathway also includes the consideration of external exposure to irrigated soil (Appendix A, Section A.2.3). The results of the nuclide soil concentration ratios for Gv2 and Gv1.485 clearly reflect the different model assumption used in Gv2. The annual average soil concentration is used in Gv2, whereas in Gv1.485 the year-end soil concentration is used. Since there is a uniform deposition assumed over the year, the Gv2 soil concentrations are one-half those calculated by Gv1.485. The Gv2 model more accurately assesses receptor dose.

The Surface Water Recreation pathway (Appendix A, Section A.4.1) includes external exposure to contaminated water from swimming and boating; external exposure to contaminated shoreline; and incidental ingestion of water while swimming. The intake/exposure evaluations differ across the pathways. The exposures from swimming and boating are directly related to water concentrations; the shoreline exposure adds additional water-to-sediment transfer modeling and sediment density factors; and the swimming water ingestion model generally corresponds to the food ingestion intakes discussed earlier.

The contaminated shoreline exposure data for the two codes follow the same trend as the water concentrations (Appendix A, Section A.5.2). The comparison for the remaining Recreation pathways (swimming and boating external exposure rate; and swimming water ingestion) follows the same trend as the water concentrations with the exception of Y-90, where the Gv2 values are twice those of Gv1.485 and boat external dose for all nuclides. The Gv2 Y-90 exposure rates are conservative at twice the Gv1.485 value. The difference in boat external dose indicates a modeling difference between Gv1.485 and Gv2. Gv1.485 uses water immersion dose factors that depend on dose rate at the water surface. Gv2 uses dose factors calculated for a receptor within the water medium. The difference in dose factors is a factor of two. Both codes appropriately use their own dose factors.

4.3.2 Air Scenario Intake/Exposure and Dose

The Air Scenario releases from the 100, 200, 300, and 400 Areas result in intakes (or external exposure) and subsequent dose to the Sagemoor receptor. The 300 Area releases include the greatest number of nuclides and the release point is closest to the receptor location. The 300 Area releases result in the greatest dose impact among the Hanford Site operating areas in 2008 (over 97% of the dose from either the Gv1.485 or Gv2 evaluations). The Terrestrial Food pathway from the 300 Area releases produces the highest intake and dose consequences among the Air scenario pathways (see Table 4.1, Table 4.2, and Appendix B, Section B.6.1). Therefore, the following discussion of intake, exposure, and dose comparisons between the two GENII models focuses on those results.

The nuclide intake rates from Air scenario Terrestrial Food pathways result from atmospheric deposition of nuclides on vegetation and consumption rates for the various food types by people and animals. Tritium is by far the greatest dose contributor to the Air scenario dose from 300 Area releases. As discussed in Section 4.3.1, the tritium model was revised in Gv2. Despite differences in the tritium models, the 300 Area tritium releases contribute over 99% of the 300 Area Terrestrial Food dose for both GENII codes (see Appendix B, Section B.6.1). Another difference in the 300 Area release Terrestrial Food pathway is that the Gv2 model does not incorporate Rn-222 progeny into foods to the same extent as Gv1.485. This pathway generally contributes very small absolute doses compared to inhalation of the Rn-222 progeny; therefore, the dose from Rn-222 progeny in food is small relative to the total for either code.

The 200 Area is the only location with atmospheric releases of I-129. Food pathways are important exposure pathways for radioiodines, particularly incorporation into milk following deposition on pasture grass. In order to mimic Gv1.485 air dispersion of iodine to the greatest extent in Gv2, I-129 from the 200 Area was modeled as a particulate. This resulted in iodine air concentrations at the receptor location that were of similar magnitude in both codes. However, the Gv2 iodine particulate modeling in Terrestrial Food pathways does not entrain iodine into the foods to as great as an extent (Gv2:Gv1.485 ratios are less than 0.5) (see Appendix B, Section B.5.1.2). This may be the result of the deposition mechanisms modeled in Gv2. Modeling the I-129 release from the 200 Area as a gas and particulate (one-third each: reactive gas, non-reactive gas, and particulate) produces about the same air concentration, but even lower entrainment in the foods. Modeling the I-129 release as 100% gas significantly reduces its air concentration estimate at the receptor location. Therefore, the implemented Gv2 iodine release is conservative. More realistic iodine modeling that is available in Gv2 could be implemented and would result in a lower dose impact.

The Air scenario Inhalation pathway contributes about 20% of the total dose to the MEI in both Gv2 and Gv1.485 (see Table 4.1 and Table 4.2). As in the food pathways, the predominant dose contributors are the 300 Area releases of H-3 and Rn-220 with progeny (see Appendix B, Section B.6.2). The Rn-220 Inhalation pathway dose in Gv2 is twice that of Gv1.485, primarily because of the difference in the Bi-212 dose estimate, which reflects the intentional overestimation of Bi-212, discussed previously.

The Air scenario external dose from plume and soil deposition contributes less than 2% of the dose to the Sagemoor receptor in both Gv2 and Gv1.485 (see Table 4.1 and Table 4.2). Radon releases account for the majority of the external dose – Rn-222 for the plume external dose pathway and Rn-220 progeny for the soil deposition pathway (see Appendix B, Section B.6.3). Little soil deposition of Rn-222 is modeled in Gv2 compared to that of Gv1.485, as demonstrated by the very low dose ratios for radon progeny (see Appendix B, Section B.5.3). All Rn-222 progeny contribute very little to the total External plume dose in either code, most dose is assigned to the Rn-222 itself (see Appendix B, Section B.6.3).

In contrast, significant External Exposure pathway dose contributions are assigned to the progeny of Rn-220. The greatest difference in the external plume pathway dose is for Bi-212, which changes the relative contribution for the Rn-220 decay chain from 0.45% in Gv1.485 to 36% in Gv2. This is a direct result of the overestimated Bi-212 release applied in Gv2. (see Section 4.1 discussion of Bi-212.) For the Air scenario External-soil deposition pathway, Rn-220 and progeny nuclide relative dose contributions to the total are the same for both codes (Appendix B, Section B.6.3).

The Air scenario External soil deposition pathway warrants further discussion, regarding the soil deposition models of the Gv1.485 and Gv2 codes. Since the Gv2 code uses year-averaged soil concentrations, one would expect the Gv2:Gv1.485 ratios (Appendix B, Section B.5.3) for soil concentration and dose to be roughly 0.5. This is not the case, however. The Gv1.485 code models deposition with an (air concentration) times (dry deposition velocity) calculation, with the particulate deposition velocity of 0.001 m/s and the iodine deposition velocity of 0.01 m/s. The Gv2 code is more complex, with the addition of wet deposition; and a deposition modeling dependent on user-defined particle size and density and meteorological factors (surface roughness and stability class). An illustrative example is presented using plutonium-239 in Table 4.8. To determine the net average deposition velocity of Gv2, the sum of the plutonium-239 wet and dry deposition rates is divided by the air concentration at the receptor location – all of which are available in the Gv2 ATO file. Then, the result is divided by the Gv1.485 deposition rate (0.001 m/s) to determine the comparative ratio for each release point (see Table 4.8). When the

average (of Gv2) vs. year-end(of Gv1.485) soil concentration modeling is taken into account, the original soil aerial activity and dose ratios (Appendix B, Section B.5.3) normalized to air concentration are consistent.

Table 4.8. Deposition Velocity Comparison between Gv2 and Gv1.485 (Pu-239 example)

Release Point	Receptor Location Relative to Release Point[(a)]	Gv2 Dry Deposition (Bq/m^2 per s)	Gv2 Wet Deposition (Bq/m^2 per s)	Gv2 Air Concen-tration (Bq/m^3)	Gv2 Net Deposition Velocity (m/s)	Gv1.485 Deposition Velocity (m/s)	Ratio Gv2:Gv1.485 Deposition Velocities
100 Area	135 deg 40260 m	2.23E-13	1.64E-15	1.2E-10	0.001875	0.001	1.88
200 Area	135 deg 40260 m	1.69E-12	3.50E-14	1.23E-09	0.001402	0.001	1.40
300 Area	90 deg 805 m	9.11E-13	1.71E-13	4.14E-10	0.002614	0.001	2.61
400 Area	135 deg 12070 m	4.69E-13	3.40E-14	1.87E-10	0.002689	0.001	2.69

(a) Direction and sector-midpoint distance from the release point to Sagemoor receptor relative to the atmospheric dispersion radial grid. The radial grid centerpoint is the release point and sector distances are indicated in Table 3.7. The receptor is located within the sector identified.

4.4 Conclusion and Discussion

To conclude, the GENIIv2 code provides the user greater flexibility in modeling site-specific scenarios than GENIIv1.485. This evaluation presents a baseline comparison of the two codes for the release locations, nuclide-specific release rates, and meteorology used for modeling doses from the Hanford Site operations during CY08. As long as the user understands the model revisions and how Gv2 applies input parameters compared to that of Gv1.485, some variability for pathway- and nuclide-specific dose results are anticipated, and the net dose impact is of primary interest. The net result is that Gv2 results provide similar overall dose estimates to the maximally impacted receptor for Hanford Site releases.

The Gv2 code implementation performed for this report did not complicate the comparison by implementing additional functionality in Gv2 cases. The simplest mimicry of the Gv1.485 model was implemented and those results were compared. This presents the baseline comparison of the two codes for the release locations, release-site-specific nuclides, nuclide-specific release rates, and 2008 meteorology for the Hanford Site.

In general, use of the Gv2 code to perform dose estimates for compliance status determinations for radioactive material releases from the Hanford Site would yield dose estimates that meet state and federal standards, presuming that the compliance agency (state or federal) accepted use of the Gv2 code results. It is acknowledged that the Gv2 radon modeling, particularly for Rn-222, could be implemented in a more complex manner. As an alternative, the EPA CAP88-PC code could be used for comparison or actual dose assignment.

Updating the receptor dose estimate using GENIIv2 in the manner described in this report would be one step, as it bridges the transition from the DOS-based GENIIv1.485 to more current Windows-based code implementation. Two additional steps to consider for updating Hanford Site dose estimates are implementation of International Commission on Radiological Protection Publication 60 (ICRP60) dose factors in the dose estimates; and use of the GENIIv2 default plant and biota transfer factors.

Although DOE 5400.5 currently specifies the use of ICRP26/30 dose factors, a replacement Order, Draft DOE Order 458.1 (issued 10-22-09), is currently undergoing review to update public dose guidelines and reporting requirements for DOE facilities using ICRP60-based tissue and radiation weighting factors. As a proactive step to determine the potential impact of such a change, the ICRP60 methodology was implemented in Gv2. This was simply executed by a single change in the final Health Impact Module by selecting FGR 12/13 dose factors instead of the FGR 11/12 option implemented to generate results discussed earlier in this report.[2] The results are shown in Table 4.9. The Table 4.9 results can be compared to the Gv1.485 (Table 4.1) and Gv2 ICPR26/30 (Table 4.2) results. As described earlier, the Gv2 ICRP26/30 results are greater than Gv1.485 by a factor of 1.12. Table 4.9 results indicate that Gv2 ICRP60 results are greater than Gv1.485 by a factor of 2.56. Both remain within the acknowledged factor of 10 uncertainty for environmental dose modeling. Additionally, neither increase would be of sufficient magnitude to affect the Hanford Site's federal or state dose standard compliance status. Use of ICRP 60 dose factors also corrects the radon dose incorporation of very short-lived implicit progeny impacts that was identified in the ICRP26/30 results presented earlier (see Section 4.1).

Table 4.9. GENIIv2 Dose Results with ICRP60 Dose Factors Implemented (mrem)

	Release Location					% Total Dose by	% Total Dose All
Pathway	100 Area	200 Area	300 Area	400 Area	**Total**	Pathway	Pathways
AIR							
External	1.0E-09	1.2E-07	8.0E-04	2.6E-08	**8.0E-04**	0.9%	0.7%
Inhalation	5.4E-06	2.8E-05	4.8E-02	2.6E-06	**4.8E-02**	52%	42%
Terr. Foods	5.7E-07	1.6E-04	4.4E-02	1.3E-06	**4.4E-02**	47%	38%
Subtotal Air	5.9E-06	1.8E-04	9.3E-02	3.9E-06	**9.3E-02**	100%	81%
WATER							
Recreation	8.6E-09	1.3E-04	0	0	**1.3E-04**	0.6%	0.11%
Terr. Foods	5.1E-07	8.6E-03	0	0	**8.6E-03**	39%	7.5%
Aqu. Food	1.2E-06	1.4E-02	0	0	**1.4E-02**	61%	12%
Subtotal Water	1.7E-06	2.2E-02	0	0	**2.2E-02**	100%	19%
Total	**7.6E-06**	**2.3E-02**	**9.3E-02**	**3.9E-06**	**1.2E-01**		**100%**

Another recommendation for future updates to receptor dose estimates for the Hanford Site, which can readily be implemented within the current Gv2 software, is the consideration of updated transfer factors. The transfer factors implemented in GENIIv1.485 were those available at the time of code development (1988). The Gv2 default transfer factors consider more recent data, including more recent internationally accepted values (see Napier et al. 2008, Appendix D). For the relatively small set of nuclides and biota (feed and food types) evaluated for dose assessment, it may be worthwhile to review the default transfer factors in Gv2 to determine whether they are different than those of Gv1.485; and if so, do they have a stronger basis for use over the transfer factors in Gv1.485. Staven et al. 2003 would also be useful in this review.

[2] Selection of FGR 12/13 also required re-entry of lung solubility classes for each nuclide, but these were identical to those entered previously and which are tabulated in Table 2.2, Table 3.2, and Table 3.3.

5.0 References

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Appendix A

Surface Water Scenario Results

Appendix A

Surface Water Scenario Results

Appendix A contains numerous tables of the results of the Surface Water scenario results for both Gv1.485 and Gv2.

- Section A.1 compares the water concentration results.
- Section A.2, A.3, and A.4 provides annual intake (or exposure) by nuclide and pathway. In addition, these sections contain doses resulting from intakes estimated for each code.
- Section A.5 provides a nuclide-specific Gv2:Gv1.485 ratio summary from water concentration through dose, so that differences in the codes' handling of data can be more easily identified. Ratios are presented as follows:
    - Water concentration ratio,
    - Intake (or exposure) ratio, and
    - Dose ratio
- Section A.6 contains a detailed dose summary by pathway. Both the dose and the percent contribution to the total pathway dose are presented.

A.1 SW- Water Concentration at Receptor Location

A.2 SW- Terrestrial Food Intake and Garden Soil External Exposure

A.2.1 SW- Terrestrial Food Radionuclide Intake
A.2.2 SW- Terrestrial Food Dose by Food Type
A.2.3 SW- Terrestrial Food Garden Soil Exposure and Dose

A.3 SW- Aquatic Food Intake and Dose

A.4 SW- Recreation
A.4.1 SW- Recreation Exposure or Intake
A.4.2 SW- Recreation Dose

A.5 SW- Ratios of GENIIv2 and GENIIv1.485 Results
A.5.1 SW- Terrestrial Food and Garden External Gv2:Gv1.485 Ratios
A.5.2 SW- Aquatic Food and SW-Recreation Gv2:Gv1.485 Ratios

A.6 SW- Dose Summary

Appendix A

A.1 SW- Water Concentration at Receptor Location

CONCENTRATION and RATIO

	SW Conc Gv1.485 100 & 200 Areas pCi/L	SW Conc Gv2 100 & 200 Areas pCi/L	SW Conc Ratio Gv2: Gv1.485
H3	1.40E+01	1.45E+01	1.03
OBT	N/A	0	0/(N/A)
Sr90	2.20E-06	2.17E-06	0.99
Y90	4.00E-07	4.03E-07	1.01
Pa234	2.50E-07	3.31E-15	1.3E-08
Th234	3.90E-04	3.92E-04	1.01
U234	1.00E-02	1.00E-02	1.00
U238	3.00E-02	3.00E-02	1.00
Pu239	8.00E-08	7.95E-08	0.99

A.2 SW- Terrestrial Food Intake and Garden Soil External Exposure

A.2.1 SW- Terrestrial Food Radionuclide Intake

INTAKE Gv1.485

	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr
H3	4.0E+02	2.9E+03	4.3E+03	0	9.8E+02	2.0E+02	3.8E+03	3.3E+02
OBT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sr90	8.4E-04	1.7E-03	1.6E-03	0	2.3E-04	4.1E-07	6.8E-04	5.9E-06
Y90	7.2E-04	1.4E-03	1.3E-03	0	2.3E-04	1.1E-07	1.6E-04	1.3E-06
Pa234	6.6E-03	6.6E-03	5.8E-03	0	1.9E-02	5.6E-06	1.2E-04	7.7E-06
Th234	4.2E+00	4.2E+00	3.7E+00	0	1.2E+01	5.5E-03	1.2E-01	7.6E-03
U234	3.7E+00	3.1E+00	2.7E+00	0	2.5E-01	6.5E-02	1.3E+00	8.9E-02
U238	1.1E+01	9.2E+00	8.0E+00	0	7.4E-01	1.9E-01	3.9E+00	2.7E-01
Pu239	2.9E-05	2.4E-05	2.1E-05	0	2.0E-08	6.4E-11	1.7E-09	5.7E-09

INTAKE Gv2

	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr
H3	3.5E+02	2.1E+03	3.2E+03	0	3.0E+02	0	3.3E+03	0
OBT	2.0E+01	2.6E+02	3.4E+02	0	1.2E+02	0	2.5E+02	0
Sr90	8.2E-04	1.2E-03	1.1E-03	0	2.2E-04	4.1E-07	6.5E-04	5.9E-06
Y90	7.2E-04	1.0E-03	9.3E-04	0	2.2E-04	9.5E-08	1.5E-04	1.3E-06
Pa234	2.0E-15	8.0E-20	7.0E-20	0	0	5.9E-18	1.4E-17	4.9E-18
Th234	4.2E+00	4.2E+00	3.6E+00	0	1.2E+01	5.5E-03	1.2E-01	7.6E-03
U234	3.6E+00	3.1E+00	2.7E+00	0	2.5E-01	6.5E-02	1.3E+00	8.9E-02
U238	1.1E+01	9.2E+00	8.0E+00	0	7.4E-01	1.9E-01	3.9E+00	2.7E-01
Pu239	2.9E-05	2.4E-05	2.1E-05	0	2.0E-08	6.4E-11	1.7E-09	5.7E-09

Note: Organically Bound Tritium is not modeled in Gv1.485.

INTAKE RATIOS

	Leafy Veg Ratio	Root Veg Ratio	Fruit Ratio	Grain Ratio	Meat Ratio	Poultry Ratio	Milk Ratio	Egg Ratio
	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485
H3	0.89	0.72	0.75	0/0	0.31	0/300	0.87	0/320
H3+OBT	20.70	263.42	335.89	0/0	118.41	0/300	254.65	0/320
Sr90	0.97	0.70	0.68	0/0	0.96	1.00	0.96	0.99
Y90	0.99	0.74	0.71	0/0	0.97	0.87	0.94	1.04
Pa234	3.E-13	1.E-17	1.E-17	0/0	0/0.019	1.E-12	1.E-13	6.E-13
Th234	1.00	0.99	0.99	0/0	0.96	1.00	0.96	1.00
U234	0.99	0.99	0.99	0/0	1.00	1.00	1.00	1.00
U238	0.99	1.00	1.00	0/0	1.00	1.02	1.00	0.99
Pu239	1.00	1.01	1.01	0/0	0.99	1.01	1.01	1.01

A.2.2 SW- Terrestrial Food Dose by Food Type

	DOSE Gv1.485								DOSE Gv2							
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem
H3	2.4E-08	1.8E-07	2.6E-07	0	6.0E-08	1.3E-08	2.3E-07	2.0E-08	2.3E-08	1.3E-07	2.1E-07	0	1.9E-08	0	2.1E-07	0
OBT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.3E-09	1.7E-08	2.2E-08	0	7.6E-09	0	1.6E-08	0
Sr90+	1.1E-10	2.2E-10	2.1E-10	0	3.0E-11	5.1E-14	8.4E-11	7.2E-13	1.2E-10	1.8E-10	1.6E-10	0	3.4E-11	6.0E-14	9.5E-11	8.5E-13
Y90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90
Pa234	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238
Th234	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238	see U238
U234	9.6E-08	8.0E-08	7.0E-08	0	6.5E-09	1.7E-09	3.4E-08	2.3E-09	9.5E-08	8.0E-08	7.0E-08	0	6.5E-09	1.7E-09	3.4E-08	2.3E-09
U238+	3.2E-07	2.7E-07	2.4E-07	0	1.8E-07	4.6E-09	9.3E-08	6.5E-09	3.2E-07	2.7E-07	2.4E-07	0	1.7E-07	4.7E-09	9.4E-08	6.4E-09
Pu239	1.4E-12	1.2E-12	1.0E-12	0	9.8E-16	3.2E-18	8.4E-17	2.8E-16	1.5E-12	1.3E-12	1.1E-12	0	1.0E-15	3.3E-18	8.9E-17	3.0E-16
Total	**4.4E-07**	**5.3E-07**	**5.7E-07**	**0.0E+00**	**2.5E-07**	**1.9E-08**	**3.6E-07**	**2.9E-08**	**4.4E-07**	**5.1E-07**	**5.4E-07**	**0.0E+00**	**2.1E-07**	**6.4E-09**	**3.6E-07**	**8.8E-09**

DOSE RATIOS

	Leafy Veg Ratio	Root Veg Ratio	Fruit Ratio	Grain Ratio	Meat Ratio	Poultry Ratio	Milk Ratio	Egg Ratio
	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485
H3	0.93	0.76	0.79	0/0	0.32	0/1E-8	0.90	0/2E-8
H3+OBT	0.98	0.86	0.87	0/0	0.44	0/1E-8	0.97	0/2E-8
Sr90+	1.12	0.84	0.79	0/0	1.12	1.18	1.12	1.17
Y90	N/A	N/A	N/A	0/0	N/A	N/A	N/A	N/A
Pa234	N/A	N/A	N/A	0/0	N/A	N/A	N/A	N/A
Th234	N/A	N/A	N/A	0/0	N/A	N/A	N/A	N/A
U234	1.00	1.00	1.00	0/0	1.00	1.00	1.01	1.02
U238+	1.00	1.01	1.02	0/0	0.97	1.02	1.01	1.00
Pu239	1.05	1.06	1.06	0/0	1.04	1.03	1.07	1.05

A.2.3 SW- Terrestrial Food Garden Soil Exposure and Dose

EXPOSURE and RATIOS

	Surf Soil Gv1.485 100&200 Areas pCi/m2	Surf Soil Gv2 100&200 Areas pCi/m2	Surf Soil Ratio Gv2: Gv1.485
H3	0	0	0/0
OBT	N/A	0	H3+OBT=0/0
Sr90	1.1E-03	5.5E-04	0.50
Y90	1.1E-03	5.4E-04	0.49
Pa234	2.2E-02	1.9E-15	8.E-14
Th234	1.4E+01	6.3E+00	0.45
U234	5.1E+00	2.5E+00	0.49
U238	1.5E+01	7.5E+00	0.50
Pu239	4.0E-05	2.0E-05	0.51

Note: Organically Bound Tritium is not modeled in Gv1.485.

DOSE and RATIOS

	Surf Soil Gv1.485 100&200 Areas rem	Surf Soil Gv2 100&200 Areas rem	Surf Soil Ratio Gv2: Gv1.485
H3	0	0	0/0
OBT	N/A	0	H3+OBT=0/0
Sr90+	6E-14	3.0E-14	0.50
Y90	1.3E-12	6.5E-13	0.50
Pa234	5.4E-09	4.6E-22	8.E-14
Th234	4.8E-08	2.2E-08	0.45
U234	1.2E-09	6.2E-10	0.51
U238+	3.0E-09	1.5E-09	0.50
Pu239	4.1E-15	2.1E-15	0.51
Total	**5.8E-08**	**2.4E-08**	

A.3 SW- Aquatic Food Intake and Dose

INTAKE and RATIOS

	Aqu.Food Gv1.485 100&200 Areas pCi/y	Aqu.Food Gv2 100&200 Areas pCi/yr	Aqu.Food Ratio Gv2: Gv1.485
H3	5.8E+02	5.8E+02	1.00
OBT	N/A	0.E+00	see H3
Sr90	4.3E-03	4.3E-03	1.01
Y90	9.9E-04	1.3E-03	1.32
Pa234	1.7E-03	3.3E-13	2E-10
Th234	1.7E+00	3.2E+00	1.89
U234	2.0E+01	2.0E+01	1.00
U238	6.0E+01	6.0E+01	1.00
Pu239	8.0E-04	7.9E-04	0.99

Note: Organically Bound Tritium is not modeled in Gv1.485.

DOSE and RATIOS

	Aqu.Food Gv1.485 100&200 Areas rem	Aqu.Food Gv2 100&200 Areas rem	Aqu.Food Ratio Gv2: Gv1.485
H3	3.6E-08	3.7E-08	1.03
OBT	N/A	0.0E+00	See H3
Sr90	5.2E-10	6.2E-10	1.18
Y90	1.1E-11	1.4E-11	1.27
Pa234	3.8E-12	7.1E-22	2E-10
Th234	2.3E-08	4.4E-08	1.91
U234	5.2E-07	5.2E-07	1.01
U238	1.4E-06	1.4E-06	1.01
Pu239	4.0E-11	4.1E-11	1.03
Total	**2.0E-06**	**2.0E-06**	

A.4 SW- Recreation

A.4.1 SW- Recreation Exposure or Intake

	EXPOSURE or INTAKE Gv1.485				EXPOSURE or INTAKE Gv2			
	ExtBoat	ExtSwim	ExtShore	IngestSwim	ExtBoat	ExtSwim	ExtShore	IngestSwim
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	pCi/L	pCi/L	pCi/m2	pCi/y	pCi/L	pCi/L	pCi/m2	pCi/yr
H3	1.6E-01	1.6E-01	4.1E+03	2.9E+01	1.6E-01	1.6E-01	4.1E+03	2.9E+01
OBT	N/A	N/A	N/A	N/A	0	0	0	0
Sr90	2.5E-08	2.5E-08	6.2E-04	4.3E-06	2.5E-08	2.5E-08	6.2E-04	4.3E-06
Y90	2.0E-09	2.0E-09	6.1E-04	3.6E-07	4.6E-09	4.6E-09	6.1E-04	8.1E-07
Pa234	0	0	1.2E-02	0	3.8E-17	3.8E-17	1.1E-15	6.6E-15
Th234	0	0	7.8E+00	0	4.5E-06	4.5E-06	7.8E+00	7.8E-04
U234	1.1E-04	1.1E-04	2.9E+00	2.0E-02	1.1E-04	1.1E-04	2.9E+00	2.0E-02
U238	3.4E-04	3.4E-04	8.6E+00	6.0E-02	3.4E-04	3.4E-04	8.7E+00	6.0E-02
Pu239	9.1E-10	9.1E-10	2.3E-05	1.6E-07	9.1E-10	9.1E-10	2.3E-05	1.6E-07

Note: Organically Bound Tritium is not modeled in Gv1.485.

EXPOSURE and INTAKE RATIOS

	ExtBoat Ratio	ExtSwim Ratio	ExtShore Ratio	IngestSwim Ratio
	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485	Gv2: Gv1.485
H3+OBT	1.03	1.03	0.99	1.00
OBT	see H3	see H3	see H3	see H3
Sr90	0.99	0.99	1.00	1.01
Y90	2.30	2.30	1.01	2.24
Pa234	4E-17/0	4E-17/0	8.8E-14	7E-15/0
Th234	4E-6/0	4E-6/0	1.01	8E-4/0
U234	1.04	1.04	1.00	1.00
U238	1.00	1.00	1.01	1.00
Pu239	1.00	1.00	1.00	0.99

A.4.2 SW- Recreation Dose

	DOSE Gv1.485				DOSE Gv2			
	ExtBoat Gv1.485 100&200 Areas rem	ExtSwim Gv1.485 100&200 Areas rem	ExtShore Gv1.485 100&200 Areas rem	IngSwim Gv1.485 100&200 Areas rem	ExtBoat Gv2 100&200 Areas rem	ExtSwim Gv2 100&200 Areas rem	ExtShore Gv2 100&200 Areas rem	IngSwim Gv2 100&200 Areas rem
H3	1.7E-16	3.4E-16	8.1E-13	1.8E-09	1.8E-16	1.8E-16	8.0E-13	1.9E-09
OBT	N/A	N/A	N/A	N/A	0	0	0	0
Sr90+	1.7E-16	3.5E-16	7.7E-13	5.2E-13	3.4E-16	3.4E-16	7.8E-13	6.2E-13
Y90	see Sr90	see Sr90	see Sr90	3.9E-15	see Sr90	see Sr90	see Sr90	8.7E-15
Pa234	see U238	see U238	see U238	0	see U238	see U238	see U238	1.4E-23
Th234	see U238	see U238	see U238	0	see U238	see U238	see U238	1.1E-11
U234	2.1E-13	4.2E-13	7.1E-10	5.2E-10	2.2E-13	2.2E-13	7.1E-10	5.2E-10
U238+	4.4E-13	8.9E-13	3.2E-08	1.4E-09	1.3E-12	1.3E-12	2.9E-08	1.4E-09
Pu239	8.7E-19	1.7E-18	2.4E-15	8.0E-15	8.7E-19	8.7E-19	2.4E-15	8.3E-15
Total	**6.5E-13**	**1.3E-12**	**3.3E-08**	**3.7E-09**	**1.5E-12**	**1.5E-12**	**3.0E-08**	**3.8E-09**

DOSE RATIOS

	ExtBoat Ratio Gv2: Gv1.485	ExtSwim Ratio Gv2: Gv1.485	ExtShore Ratio Gv2: Gv1.485	IngSwim Ratio Gv2: Gv1.485
OBT+H3	1.03	0.51	0.99	1.03
OBT	see H3	see H3	see H3	see H3
Sr90+	2.01	0.97	1.01	1.18
Y90	see Sr90	see Sr90	see Sr90	2.22
Pa234	see U238	see U238	see U238	1E-23/0
Th234	see U238	see U238	see U238	1E-11/0
U234	1.03	0.51	1.00	1.01
U238+	2.90	1.43	0.90	1.02
Pu239	1.00	0.51	0.99	1.03

A.5 SW-Ratios of GENIIv2 and GENIIv1.485 Results

A.5.1 SW- Terrestrial Food and Garden External Gv2:Gv1.485 Ratios

SW TERRESTRIAL FOOD CROPS - RATIOS SUMMARY

	Concentratior	Intake				Dose			
	Ratio Surf Water Conc	Ratio Ci ing fr LfyVeg	Ratio Ci ing fr Roots	Ratio Ci ing fr Fruit	Ratio Ci ing fr Grain	Ratio Dose fr LfyVeg	Ratio Dose fr Roots	Ratio Dose fr Fruit	Ratio Dose fr Grain
	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485
H3	1.03	0.89	0.72	0.75	0/0	0.93	0.76	0.79	0/0
Sr90	0.99	0.97	0.70	0.68	0/0	1.12	0.84	0.79	0/0
Y90	1.01	0.99	0.74	0.71	0/0	N/A	N/A	N/A	0/0
U234	1.00	0.99	0.99	0.99	0/0	1.00	1.00	1.00	0/0
U238	1.00	0.99	1.00	1.00	0/0	1.00	1.01	1.02	0/0
Th234	1.01	1.00	0.99	0.99	0/0	N/A	N/A	N/A	0/0
Pa234	1E-08	3E-13	1E-17	1E-17	0/0	N/A	N/A	N/A	0/0
Pu239	0.99	1.00	1.01	1.01	0/0	1.05	1.06	1.06	0/0

SW TERRESTRIAL FOOD ANIMAL PRODUCTS - RATIOS SUMMARY

	Concentratior	Intake				Dose			
	Ratio Surf Water Conc	Ratio Ci ing fr Meat	Ratio Ci ing fr Poultry	Ratio Ci ing fr Milk	Ratio Ci ing fr Egg	Ratio Dose fr Meat	Ratio Dose fr Poultry	Ratio Dose fr Milk	Ratio Dose fr Egg
	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485
H3	1.03	0.31	0/300	0.87	0/320	0.32	0/1E-8	0.90	0/2E-8
Sr90	0.99	0.96	1.00	0.96	0.99	1.12	1.18	1.12	1.17
Y90	1.01	0.97	0.87	0.94	1.04	n/a	n/a	n/a	n/a
U234	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.02
U238	1.00	1.00	1.02	1.00	0.99	0.97	1.02	1.01	1.00
Th234	1.01	0.96	1.00	0.96	1.00	N/A	N/A	N/A	N/A
Pa234	1.E-08	0/0.019	1.E-12	1.E-13	6.E-13	N/A	N/A	N/A	N/A
Pu239	0.99	0.99	1.01	1.01	1.01	1.04	1.03	1.07	1.05

SW TERRESTRIAL FOOD GARDEN SOIL - RATIOS SUMMARY

	Concentration	Exposure	Dose
	Ratio Surf Water Conc	Ratio Aerial Activity	Ratio Dose fr Irrsoil ext
	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485
H3	1.03	0/0	0/0
Sr90	0.99	0.50	0.50
Y90	1.01	0.49	0.50
U234	1.00	0.49	0.51
U238	1.00	0.50	0.50
Th234	1.01	0.45	0.45
Pa234	1.E-08	8.E-14	8.E-14
Pu239	0.99	0.51	0.51

A.5.2 SW- Aquatic Food and SW-Recreation Gv2:Gv1.485 Ratios

AQUATIC FOOD -RATIOS SUMMARY

	Concentration	Intake	Dose
	Ratio Surf Water Conc	**Ratio Ci ing fr Fish**	**Ratio Dose fr Fish**
	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485
H3	1.03	1.00	1.03
Sr90	0.99	1.01	1.18
Y90	1.01	1.32	1.27
U234	1.00	1.00	1.01
U238	1.00	1.00	1.01
Th234	1.01	1.89	1.91
Pa234	1.E-08	2.E-10	2.E-10
Pu239	0.99	0.99	1.03

SURFACE WATER RECREATION - RATIOS SUMMARY

	Concentration	Exposure or Intake				Dose			
	Ratio Surf Water Conc	**Ratio Boat water conc**	**Ratio Swim water conc**	**Ratio Shore aerial activity**	**Ratio Ci IngSwim**	**Ratio Dose Ext Boat**	**Ratio Dose Ext swim**	**Ratio Dose Ext Shore**	**Ratio Dose Ing Swim**
	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485	Gv2:Gv1.485
H3	1.03	1.03	1.03	0.99	1.00	1.03	0.51	0.99	1.03
Sr90	0.99	0.99	0.99	1.00	1.01	2.01	0.97	1.01	1.18
Y90	1.01	2.30	2.30	1.01	2.24	n/a	n/a	n/a	2.22
U234	1.00	1.04	1.04	1.00	1.00	1.03	0.51	1.00	1.01
U238	1.00	1.00	1.00	1.01	1.00	2.90	1.43	0.90	1.02
Th234	1.01	4E-6/0	4E-6/0	1.01	8E-4/0	n/a	n/a	n/a	1E-11/0
Pa234	1.E-08	4E-17/0	4E-17/0	9.E-14	7E-15/0	n/a	n/a	n/a	1E-23/0
Pu239	0.99	1.00	1.00	1.00	0.99	1.00	0.51	0.99	1.03

A.6 SW- Dose Summary

SW-TERRESTRIAL FOOD DOSE SUMMARY

	Terrestrial Food	Terrestrial Food	Terrestrial Food	Terrestrial Food
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	7.9E-07	6.6E-07	36%	32%
Sr90	6.5E-10	5.7E-10	0%	0%
Y90	See Sr90	3.3E-11	See Sr90	0%
U234	2.9E-07	2.9E-07	13%	14%
U238	1.1E-06	7.9E-07	51%	38%
Th234	See U238	3.2E-07	See U238	16%
Pa234	See U238	4.3E-24	See U238	0%
Pu239	3.7E-12	3.9E-12	0%	0%
Total	2.2E-06	2.1E-06	100%	100%

SW-TOTAL TERRESTRIAL FOOD

	Terr. ING + EXT	Terr. ING + EXT	Terr. ING + EXT	Terr. ING + EXT
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	7.9E-07	6.6E-07	35%	32%
Sr90	6.5E-10	5.7E-10	0%	0%
Y90	1.3E-12	3.3E-11	0%	0%
U234	2.9E-07	2.9E-07	13%	14%
U238	1.1E-06	7.9E-07	49%	38%
Th234	4.8E-08	3.4E-07	2%	17%
Pa234	5.4E-09	4.6E-22	0%	0%
Pu239	3.7E-12	3.9E-12	0%	0%
Total	2.2E-06	2.1E-06	100%	100%

SW-TERRESTRIAL FOOD SOIL EXTERNAL EXP. DOSE SUMMARY

	Irrig Soil ext	Irrig Soil ext	Irrig Soil ext	Irrig Soil ext
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	0	0	0%	0%
Sr90	6.0E-14	3.0E-14	0%	0%
Y90	1.3E-12	6.5E-13	0%	0%
U234	1.2E-09	6.2E-10	2%	3%
U238	3.0E-09	1.5E-09	5%	6%
Th234	4.8E-08	2.2E-08	83%	91%
Pa234	5.4E-09	4.6E-22	9%	0%
Pu239	4.1E-15	2.1E-15	0%	0%
Total	5.8E-08	2.4E-08	100%	100%

SW-AQUATIC FOOD DOSE SUMMARY

	FISH	FISH	FISH	FISH
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	3.6E-08	3.7E-08	2%	2%
Sr90	5.2E-10	6.2E-10	0%	0%
Y90	1.1E-11	1.4E-11	0%	0%
U234	5.2E-07	5.2E-07	26%	26%
U238	1.4E-06	1.4E-06	71%	70%
Th234	2.3E-08	4.4E-08	1%	2%
Pa234	3.8E-12	7.1E-22	0%	0%
Pu239	4.0E-11	4.1E-11	0%	0%
Total	2.0E-06	2.0E-06	100%	100%

SW-RECREATION DOSE SUMMARY

	TOT RECR	TOT RECR	TOT RECR	TOT RECR
	100&200 Areas	100&200 Areas	100&200 Areas	100&200 Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	1.8E-09	1.9E-09	5%	6%
Sr90	1.3E-12	6.5E-13	0%	0%
Y90	3.9E-15	7.5E-13	0%	0%
U234	1.2E-09	1.2E-09	3%	4%
U238	3.3E-08	3.2E-09	92%	10%
Th234	See U238	2.7E-08	See U238	81%
Pa234	See U238	1.5E-21	See U238	0%
Pu239	1.0E-14	1.1E-14	0%	0%
Total	3.6E-08	3.3E-08	100%	100%

Appendix B
Air Scenario Results

Appendix B

Air Scenario Results

Appendix B contains numerous tables of the results of the Air scenario results for both Gv1.485 and Gv2.

- Section B.1 compares the air concentration results by release source term.
- Section B.2, B.3, and B.4 provides annual intake (or exposure) by nuclide and pathway. In addition, these sections contain doses resulting from intakes estimated for each code.
- Section B.5 provides a nuclide-specific Gv2:Gv1.485 ratio summary from water concentration through dose, so that differences in the codes' handling of data can be more easily identified. Ratios are presented as follows:
    - Air concentration ratio,
    - Intake (or exposure) ratio, and
    - Dose ratio
- Section B.6 contains a detailed dose summary by pathway. Both the dose and the percent contribution to the total pathway dose are presented.

B.1 Air- Air Concentrations

B.2 Air-Terrestrial Food Intake and Dose
B.2.1 Air- Terrestrial Food 100 Area Release- Radionuclide Intake and Dose
B.2.2 Air- Terrestrial Food 200 Area Release- Radionuclide Intake and Dose
B.2.3 Air- Terrestrial Food 300 Area Release- Radionuclide Intake and Dose
B.2.4 Air- Terrestrial Food 400 Area Release- Radionuclide Intake and Dose
B.3 Air- Inhalation Intake and Dose
B.4 Air- External Exposure Plume and Ground Deposition
B.4.1 Air-Plume Exposure and Dose
B.4.2 Air-Ground Deposition Exposure and Dose

B.5 Air-Ratios of GENIIv2 and GENIIv1.485 Results
B.5.1 Air- Terrestrial Food Gv2:Gv1.485 Ratios
B.5.1.1 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 100 Area Releases
B.5.1.2 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 200 Area Releases
B.5.1.3 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 300 Area Releases
B.5.1.4 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 400 Area Releases
B.5.2 Air- Inhalation Gv2:Gv1.485 Ratios
B.5.3 Air- External Exposure Gv2:Gv1.485 Ratios

B.6 Air- Dose Summary
B.6.1 Air- Terrestrial Food Dose Summary
B.6.2 Air- Inhalation Dose Summary
B.6.3 Air- External Exposure Dose Summary

B.1 Air- Air Concentrations

	100 Area Source	100 Area Source	100 Area Source
	Air Conc	Air Conc	Air Conc Ratio
	Gv1.485	Gv2	Gv1.485
	pCi/m3	pCi/m3	Ratio
Am241	3.1E-09	2.7E-09	0.85
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	4.9E-10	4.1E-10	0.85
Pu239	3.8E-09	3.2E-09	0.85
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	5.8E-09	4.9E-09	0.85
Y90	4.4E-16	5.6E-10	1.E+06

	200 Area Source	200 Area Source	200 Area Source
	Air Conc	Air Conc	Air Conc Ratio
	Gv1.485	Gv2	Gv1.485
	pCi/m3	pCi/m3	Ratio
Am241	1.9E-09	6.3E-09	3.29
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	1.6E-08	5.3E-08	3.30
H3	0	0	N/A
I129	6.6E-07	2.2E-06	3.30
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	5.6E-12	1.8E-11	3.30
Pu239	1.0E-08	3.3E-08	3.29
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	5.0E-08	1.7E-07	3.30
Y90	5.1E-16	1.4E-08	3.E+07

	300 Area Source	300 Area Source	300 Area Source
	Air Conc	Air Conc	Air Conc Ratio
	Gv1.485	Gv2	Gv1.485
	pCi/m3	pCi/m3	Ratio
Am241	1.0E-09	1.1E-09	1.09
Am243	1.8E-10	2.0E-10	1.09
Bi210	2.4E-14	2.7E-14	1.09
Bi212	2.8E-02	3.1E-02	1.09
Cs137	1.3E-08	1.4E-08	1.09
H3	4.4E+00	4.8E+00	1.09
I129	0	0	N/A
Np239	2.4E-14	2.7E-14	1.09
OBT	0	0	N/A
Pb210	2.4E-14	2.7E-14	1.09
Pb212	2.7E-03	2.9E-03	1.09
Po210	2.4E-14	2.7E-14	1.09
Pu238	5.1E-10	5.6E-10	1.09
Pu239	1.0E-08	1.1E-08	1.09
Rn220	1.8E+00	2.0E+00	1.12
Rn222	4.1E-02	4.6E-02	1.12
Sr90	1.4E-07	1.5E-07	1.09
Y90	2.4E-14	2.7E-14	1.09

	400 Area Source	400 Area Source	400 Area Source
	Air Conc	Air Conc	Air Conc Ratio
	Gv1.485	Gv2	Gv1.485
	pCi/m3	pCi/m3	Ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	2.3E-08	1.9E-08	0.84
H3	4.3E-05	3.6E-05	0.84
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	6.0E-09	5.1E-09	0.84
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A

Y-90 Air Concentration note: The Gv1.485 Y-90 air concentrations for the 100 Area and 200 Area do not report ingrowth during transport. Ingrowth is included in later modeling steps (e.g., intake and dose). The 300 Area release is much closer to the Sagemoor receptor and Y-90 ingrowth is not significant in Gv2, This explains why the 300 Area Y-90 ratio is not so disproportionate.

B.2 Air- Terrestrial Food Intake and Dose

B.2.1 Air- Terrestrial Food 100 Area Release- Radionuclide Intake and Dose

Air-TERRESTRIAL FOOD INTAKE FROM 100 AREA RELEASES

	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	3.6E-05	5.0E-05	5.1E-05	1.9E-05	1.8E-07	1.0E-10	5.7E-09	7.5E-09	5.7E-05	7.9E-05	8.1E-05	2.9E-05	2.9E-07	1.6E-10	9.1E-09	1.2E-08	1.58	1.58	1.58	1.55	1.61	1.58	1.59	1.59
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	5.6E-06	7.7E-06	7.9E-06	2.9E-06	2.8E-09	1.2E-11	3.0E-10	1.0E-09	8.8E-06	1.2E-05	1.3E-05	4.5E-06	4.5E-09	1.8E-11	4.7E-10	1.6E-09	1.58	1.59	1.59	1.57	1.59	1.53	1.56	1.64
Pu239	4.3E-05	6.0E-05	6.2E-05	2.2E-05	2.2E-08	9.1E-11	2.3E-09	8.1E-09	6.9E-05	9.6E-05	9.8E-05	3.6E-05	3.5E-08	1.4E-10	3.6E-09	1.3E-08	1.60	1.59	1.58	1.62	1.60	1.59	1.59	1.59
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	7.0E-05	1.8E-04	1.9E-04	3.6E-05	1.4E-05	3.4E-08	5.0E-05	4.8E-07	1.1E-04	2.1E-04	2.2E-04	5.5E-05	2.2E-05	5.2E-08	7.6E-05	7.4E-07	1.54	1.19	1.18	1.52	1.56	1.53	1.53	1.55
Y90	5.9E-05	1.5E-04	1.6E-04	3.6E-05	1.4E-05	1.5E-08	1.2E-05	1.1E-07	9.3E-05	1.9E-04	2.0E-04	5.5E-05	2.2E-05	1.3E-08	1.8E-05	1.7E-07	1.57	1.26	1.23	1.52	1.57	0.87	1.48	1.58

Air-TERRESTRIAL FOOD DOSE FROM 100 AREA RELEASES

	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	1.3E-10	1.8E-10	1.8E-10	7.0E-11	6.5E-13	3.6E-16	2.1E-14	2.7E-14	2.1E-10	2.9E-10	3.0E-10	1.1E-10	1.1E-12	5.8E-16	3.3E-14	4.4E-14	1.60	1.58	1.60	1.55	1.63	1.60	1.60	1.59
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	2.7E-13	3.7E-13	3.8E-13	1.4E-13	1.3E-16	5.7E-19	1.4E-17	4.8E-17	4.4E-13	6.1E-13	6.2E-13	2.3E-13	2.2E-16	9.1E-19	2.3E-17	8.1E-17	2	2	2	2	2	2	2	2
Pu239	2.1E-12	3.0E-12	3.1E-12	1.1E-12	1.1E-15	4.6E-18	1.1E-16	4.0E-16	3.6E-12	5.0E-12	5.1E-12	1.9E-12	1.8E-15	7.5E-18	1.9E-16	6.7E-16	1.66	1.65	1.66	1.68	1.65	1.64	1.67	1.65
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	9.1E-12	2.3E-11	2.5E-11	4.7E-12	1.8E-12	4.3E-15	6.2E-12	6.0E-14	1.6E-11	3.3E-11	3.4E-11	8.4E-12	3.3E-12	7.5E-15	1.1E-11	1.1E-13	1.79	1.39	1.36	1.77	1.82	1.76	1.78	1.80
Y90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90
Total	**1.4E-10**	**2.1E-10**	**2.1E-10**	**7.6E-11**	**2.5E-12**	**4.6E-15**	**6.3E-12**	**8.8E-14**	**2.3E-10**	**3.3E-10**	**3.3E-10**	**1.2E-10**	**4.4E-12**	**8.1E-15**	**1.1E-11**	**1.5E-13**								

B.2.2 Air- Terrestrial Food 200 Area Release- Radionuclide Intake and Dose

Air-TERRESTRIAL FOOD INTAKE FROM 200 AREA RELEASES

	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	2.3E-05	3.2E-05	3.2E-05	1.2E-05	1.2E-07	6.3E-11	3.6E-09	4.8E-09	1.0E-04	1.4E-04	1.4E-04	5.2E-05	5.1E-07	2.8E-10	1.6E-08	2.1E-08	4.34	4.32	4.43	4.32	4.23	4.46	4.41	4.37
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	1.9E-04	2.7E-04	2.7E-04	9.8E-05	1.4E-03	1.2E-05	7.1E-04	2.2E-06	8.4E-04	1.2E-03	1.2E-03	4.3E-04	6.4E-03	5.1E-05	3.1E-03	9.6E-06	4.44	4.33	4.42	4.41	4.56	4.26	4.38	4.35
H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I129	7.8E-02	1.2E-01	1.3E-01	4.4E-02	4.0E-02	2.1E-05	5.0E-01	5.5E-03	3.4E-02	4.8E-02	4.9E-02	1.8E-02	1.7E-02	8.7E-06	2.2E-01	2.3E-03	0.44	0.40	0.38	0.41	0.44	0.41	0.44	0.41
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	6.6E-08	9.1E-08	9.4E-08	3.4E-08	3.3E-11	1.4E-13	3.5E-12	1.2E-11	2.9E-07	4.0E-07	4.1E-07	1.5E-07	1.5E-10	6.1E-13	1.5E-11	5.4E-11	4.38	4.43	4.40	4.42	4.46	4.34	4.39	4.50
Pu239	1.2E-04	1.7E-04	1.7E-04	6.2E-05	6.1E-08	2.5E-10	6.3E-09	2.2E-08	5.2E-04	7.2E-04	7.5E-04	2.7E-04	2.7E-07	1.1E-09	2.8E-08	9.8E-08	4.37	4.26	4.39	4.40	4.39	4.41	4.42	4.46
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	6.3E-04	1.6E-03	1.7E-03	3.2E-04	1.3E-04	3.0E-07	4.5E-04	4.3E-06	2.7E-03	5.4E-03	5.6E-03	1.4E-03	5.5E-04	1.3E-06	1.9E-03	1.9E-05	4.29	3.36	3.31	4.32	4.22	4.36	4.28	4.36
Y90	5.3E-04	1.4E-03	1.4E-03	3.2E-04	1.3E-04	1.4E-07	1.0E-04	1.0E-06	2.3E-03	4.8E-03	4.9E-03	1.4E-03	5.5E-04	3.3E-07	4.4E-04	4.4E-06	4.39	3.40	3.53	4.32	4.24	2.34	4.43	4.38

Air-TERRESTRIAL FOOD DOSE FROM 200 AREA RELEASES

	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	8.5E-11	1.2E-10	1.2E-10	4.3E-11	4.3E-13	2.3E-16	1.3E-14	1.7E-14	3.6E-10	5.1E-10	5.2E-10	1.9E-10	1.9E-12	1.0E-15	5.8E-14	7.7E-14	4.28	4.31	4.41	4.37	4.28	4.53	4.47	4.45
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	9.0E-12	1.3E-11	1.3E-11	4.6E-12	6.6E-11	5.7E-13	3.4E-11	1.1E-13	4.2E-11	5.9E-11	6.0E-11	2.2E-11	3.2E-10	2.6E-12	1.6E-10	4.8E-13	4.69	4.67	4.76	4.66	4.81	4.47	4.58	4.50
H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
I129	2.0E-08	3.0E-08	3.3E-08	1.1E-08	9.9E-09	5.1E-12	1.3E-07	1.4E-09	9.5E-09	1.3E-08	1.4E-08	5.0E-09	4.8E-09	2.4E-12	6.0E-08	6.2E-10	0.48	0.44	0.41	0.45	0.49	0.47	0.48	0.45
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	3.2E-15	4.3E-15	4.5E-15	1.6E-15	1.6E-18	6.7E-21	1.7E-19	5.7E-19	1.4E-14	2.0E-14	2.1E-14	7.5E-15	7.3E-18	3.0E-20	7.6E-19	2.7E-18	5	5	5	5	5	4	5	5
Pu239	6.0E-12	8.4E-12	8.4E-12	3.1E-12	3.0E-15	1.3E-17	3.1E-16	1.1E-15	2.7E-11	3.8E-11	3.9E-11	1.4E-11	1.4E-14	5.7E-17	1.4E-15	5.1E-15	4.53	4.47	4.61	4.60	4.57	4.54	4.63	4.60
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90+	8.2E-11	2.1E-10	2.2E-10	4.3E-11	1.7E-11	3.7E-14	5.6E-11	5.3E-13	4.1E-10	8.2E-10	8.5E-10	2.1E-10	8.4E-11	1.9E-13	2.8E-10	2.7E-12	4.98	3.91	3.93	4.94	4.90	5.07	4.95	5.15
Y90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90
Total	2.0E-08	3.0E-08	3.3E-08	1.1E-08	1.0E-08	5.7E-12	1.3E-07	1.4E-09	1.0E-08	1.5E-08	1.5E-08	5.4E-09	5.2E-09	5.1E-12	6.1E-08	6.3E-10								

B.2.3 Air- Terrestrial Food 300 Area Release- Radionuclide Intake and Dose

Air-TERRESTRIAL FOOD INTAKE FROM 300 AREA RELEASES

	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	1.2E-05	1.6E-05	1.7E-05	6.1E-06	6.0E-08	3.3E-11	1.9E-09	2.5E-09	3.1E-05	4.1E-05	4.2E-05	1.6E-05	1.6E-07	8.9E-11	4.8E-09	6.7E-09	2.59	2.57	2.48	2.69	2.63	2.69	2.55	2.67
Am243	2.1E-06	2.9E-06	2.9E-06	1.1E-06	1.0E-08	5.8E-12	3.3E-10	4.3E-10	5.5E-06	7.2E-06	7.4E-06	2.9E-06	2.8E-08	1.6E-11	8.5E-10	1.2E-09	2.60	2.50	2.56	2.63	2.76	2.70	2.59	2.73
Bi210	1.6E-04	3.0E-04	3.1E-04	1.1E-04	1.3E-04	2.9E-09	3.4E-05	4.8E-09	7.5E-10	1.1E-09	1.1E-09	3.9E-10	4.6E-10	1.0E-14	1.7E-10	1.7E-14	5.E-06	4.E-06	4.E-06	4.E-06	4.E-06	4.E-06	5.E-06	4.E-06
Bi212	2.2E-01	5.8E-04	6.0E-04	0	0	0	4.3E-03	0	1.7E-07	0	0	0	0	0	5.6E-08	0	8.E-07	0/6E-04	0/6E-04	0/0	0/0	0/0	1.E-05	0/0
Cs137	1.4E-04	2.0E-04	2.1E-04	7.4E-05	1.1E-03	8.8E-06	5.4E-04	1.6E-06	3.8E-04	5.1E-04	5.2E-04	2.0E-04	2.9E-03	2.4E-05	1.4E-03	4.5E-06	2.74	2.57	2.50	2.73	2.65	2.73	2.59	2.79
H3	1.5E+04	1.1E+05	1.7E+05	2.6E+04	4.1E+04	9.3E+03	1.4E+05	1.6E+04	2.1E+04	1.2E+05	1.9E+05	6.1E+03	2.1E+04	1.6E+03	7.8E+04	3.0E+03	1.45	1.25	1.23	1.27	0.71	0.25	0.60	0.24
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	1.9E-06	3.1E-06	3.2E-06	1.1E-06	1.7E-08	8.7E-11	7.2E-09	1.8E-10	4.9E-06	7.4E-06	7.6E-06	2.9E-06	4.4E-08	2.4E-10	1.8E-08	4.9E-10	2.60	2.40	2.39	2.63	2.61	2.73	2.52	2.75
OBT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.2E+03	1.5E+04	2.0E+04	2.7E+04	8.3E+03	6.5E+02	6.0E+03	8.9E+02	see H3	see H3	see H3	see H3	see H3	see H3	see H3	see H3
Pb210	2.1E-04	3.0E-04	3.1E-04	1.1E-04	2.1E-05	2.8E-09	3.3E-06	4.7E-09	7.4E-10	1.0E-09	1.0E-09	3.9E-10	7.5E-11	1.0E-14	1.2E-11	1.7E-14	4.E-06	3.E-06	3.E-06	4.E-06	4.E-06	4.E-06	3.E-06	4.E-06
Pb212	2.0E-01	5.3E-04	5.4E-04	0	0	0	3.9E-03	0	5.3E-01	1.3E-03	1.4E-03	0	0	0	1.0E-02	0	2.64	2.52	2.54	0/0	0/0	0/0	2.58	0/0
Po210	1.4E-05	2.6E-05	2.7E-05	6.6E-05	1.2E-04	1.8E-09	8.1E-07	3.0E-09	7.4E-10	9.9E-10	1.0E-09	3.9E-10	8.8E-10	1.0E-14	4.7E-11	1.7E-14	5.E-05	4.E-05	4.E-05	6.E-06	7.E-06	6.E-06	6.E-05	6.E-06
Pu238	5.9E-06	8.1E-06	8.4E-06	3.0E-06	3.0E-09	1.2E-11	3.1E-10	1.1E-09	1.5E-05	2.1E-05	2.1E-05	8.2E-06	7.9E-09	3.3E-11	8.0E-10	2.9E-09	2.62	2.54	2.50	2.73	2.62	2.77	2.59	2.68
Pu239	1.2E-04	1.6E-04	1.7E-04	6.1E-05	6.0E-08	2.5E-10	6.2E-09	2.2E-08	3.1E-04	4.1E-04	4.2E-04	1.6E-04	1.6E-07	6.6E-10	1.6E-08	5.9E-08	2.59	2.57	2.48	2.70	2.63	2.66	2.60	2.69
Rn220	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	0	0	0	0/na	0/na	0/na	0/na	0/na	0/na	0/na	0/na
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Sr90	1.7E-03	4.3E-03	4.6E-03	8.7E-04	3.5E-04	8.2E-07	1.2E-03	1.2E-05	4.4E-03	8.6E-03	9.0E-03	2.3E-03	8.9E-04	2.2E-06	3.1E-03	3.1E-05	2.58	2.01	1.96	2.63	2.54	2.64	2.55	2.59
Y90	1.4E-03	3.7E-03	3.8E-03	8.7E-04	3.5E-04	3.7E-07	2.8E-04	2.7E-06	3.7E-03	7.5E-03	7.9E-03	2.3E-03	8.9E-04	5.4E-07	7.1E-04	7.2E-06	2.66	2.04	2.07	2.63	2.55	1.47	2.52	2.68

Air-TERRESTRIAL FOOD DOSE FROM 300 AREA RELEASES

	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	4.3E-11	5.9E-11	6.0E-11	2.2E-11	2.2E-13	1.2E-16	7.0E-15	9.1E-15	1.1E-10	1.5E-10	1.5E-10	6.0E-11	5.8E-13	3.3E-16	1.8E-14	2.4E-14	2.61	2.63	2.50	2.72	2.66	2.74	2.54	2.68
Am243	7.6E-12	1.0E-11	1.0E-11	4.0E-12	3.6E-14	2.1E-17	1.2E-15	1.6E-15	2.0E-11	2.7E-11	2.6E-11	1.1E-11	1.0E-13	5.7E-17	3.1E-15	4.3E-15	2.62	2.60	2.53	2.63	2.76	2.69	2.57	2.72
Bi210	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222
Bi212	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220
Cs137	6.6E-12	9.7E-12	9.8E-12	3.5E-12	5.2E-11	4.2E-13	2.6E-11	7.6E-14	1.9E-11	2.6E-11	2.6E-11	1.0E-11	1.5E-10	1.2E-12	7.0E-11	2.2E-13	2.90	2.65	2.67	2.90	2.80	2.87	2.72	2.94
H3	9.2E-07	6.7E-06	1.1E-05	1.6E-06	2.5E-06	5.7E-07	8.6E-06	9.7E-07	1.3E-06	7.8E-06	1.2E-05	3.9E-07	1.3E-06	1.1E-07	5.0E-06	1.9E-07	1.52	1.31	1.25	1.36	0.74	0.26	0.63	0.26
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	seeAm243	seeAm243	seeAm243	seeAm243	seeAm243	seeAm243	seeAm243	seeAm243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	see Am243	seeAm243	see Am243	see Am243	see Am243
OBT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.4E-08	9.8E-07	1.3E-06	1.7E-06	5.3E-07	4.1E-08	3.8E-07	5.7E-08	see H3	see H3	see H3	see H3	see H3	see H3	see H3	see H3
Pb210	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222
Pb212	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220	see Rn220
Po210	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222	see Rn222
Pu238	2.8E-13	3.9E-13	4.0E-13	1.4E-13	1.4E-16	5.7E-19	1.5E-17	5.3E-17	7.7E-13	1.0E-12	1.0E-12	4.1E-13	3.9E-16	1.7E-18	4.0E-17	1.5E-16	3	3	3	3	3	3	3	3
Pu239	6.0E-12	8.1E-12	8.4E-12	3.0E-12	3.0E-15	1.3E-17	3.1E-16	1.1E-15	1.6E-11	2.2E-11	2.1E-11	8.5E-12	8.2E-15	3.4E-17	8.3E-16	3.1E-15	2.68	2.71	2.54	2.80	2.72	2.74	2.72	2.78
Rn220	1.0E-08	2.6E-11	2.7E-11	0	0	0	2.0E-10	0	2.4E-08	6.1E-11	6.3E-11	0	0	0	4.6E-10	0	2.41	2.30	2.31	0/0	0/0	0/0	2.34	0/0
Rn222	1.1E-09	1.6E-09	1.7E-09	7.15E-10	3.46E-10	1.82E-14	1.9E-11	3.09E-14	5.4E-15	7.4E-15	7.3E-15	2.82E-15	2.08E-15	7.55E-20	1.5E-16	1.26E-19	5.E-06	5.E-06	4.E-06	4.E-06	6.E-06	4.E-06	8.E-06	4.E-06
Sr90	2.2E-10	5.6E-10	5.9E-10	1.1E-10	4.7E-11	1.0E-13	1.5E-10	1.5E-12	6.6E-10	1.3E-09	1.4E-09	3.5E-10	1.4E-10	3.1E-13	4.4E-10	4.5E-12	3.06	2.34	2.30	3.04	2.90	3.04	2.96	3.01
Y90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90	see Sr90
Total	9.3E-07	6.7E-06	1.1E-05	1.6E-06	2.5E-06	5.7E-07	8.6E-06	9.7E-07	1.4E-06	8.8E-06	1.3E-05	2.1E-06	1.9E-06	1.5E-07	5.4E-06	2.5E-07								

B.2.4 Air- Terrestrial Food 400 Area Release- Radionuclide Intake and Dose

Air-TERRESTRIAL FOOD INTAKE FROM 400 AREA RELEASES

	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	pCi/yr	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	2.6E-04	3.6E-04	3.7E-04	1.3E-04	2.0E-03	1.6E-05	9.6E-04	2.9E-06	5.6E-04	7.7E-04	7.9E-04	2.9E-04	4.2E-03	3.5E-05	2.1E-03	6.4E-06	2.16	2.15	2.13	2.22	2.12	2.16	2.16	2.21
H3	1.5E-01	1.1E+00	1.6E+00	2.6E-01	4.0E-01	9.0E-02	1.4E+00	1.5E-01	1.1E-01	6.5E-01	1.0E+00	3.2E-02	1.1E-01	8.7E-03	4.1E-01	1.6E-02	0.77	0.66	0.69	0.68	0.39	0.13	0.32	0.14
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.1E-03	8.1E-02	1.0E-01	1.4E-01	4.4E-02	3.4E-03	3.2E-02	4.7E-03	see H3	see H3	see H3	see H3	see H3	see H3	see H3	see H3
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu239	6.9E-05	9.6E-05	9.8E-05	3.6E-05	3.5E-08	1.4E-10	3.7E-09	1.3E-08	1.5E-04	2.0E-04	2.1E-04	7.8E-05	7.6E-08	3.2E-10	7.9E-09	2.8E-08	2.17	2.13	2.15	2.18	2.18	2.26	2.13	2.16
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Y90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Air-TERRESTRIAL FOOD DOSE FROM 400 AREA RELEASES

	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area
	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg	Leafy Veg	Root Veg	Fruit	Grain	Meat	Poultry	Milk	Egg
	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv1.485	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1	Gv2:Gv1
	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	rem	ratio	ratio	ratio	ratio	ratio	ratio	ratio	ratio
Am241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Am243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bi212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cs137	1.3E-11	1.7E-11	1.8E-11	6.2E-12	9.7E-11	7.6E-13	4.5E-11	1.3E-13	2.8E-11	3.9E-11	3.9E-11	1.4E-11	2.1E-10	1.7E-12	1.0E-10	3.2E-13	2.24	2.26	2.22	2.33	2.19	2.28	2.27	2.38
H3	9.2E-12	6.7E-11	9.7E-11	1.6E-11	2.4E-11	5.5E-12	8.6E-11	9.2E-12	7.0E-12	4.2E-11	6.5E-11	2.1E-12	7.1E-12	5.6E-13	2.7E-11	1.0E-12	0.80	0.70	0.73	0.72	0.41	0.14	0.33	0.14
I129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Np239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OBT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.9E-13	5.2E-12	6.6E-12	9.2E-12	2.8E-12	2.2E-13	2.0E-12	3.0E-13	see H3	see H3	see H3	see H3	see H3	see H3	see H3	see H3
Pb210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pb212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Po210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pu239	3.5E-12	4.8E-12	4.8E-12	1.8E-12	1.7E-15	6.9E-18	1.9E-16	6.4E-16	7.8E-12	1.1E-11	1.1E-11	4.1E-12	4.0E-15	1.6E-17	4.1E-16	1.5E-15	2.24	2.22	2.25	2.25	2.28	2.37	2.20	2.27
Rn220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rn222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Y90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	**2.5E-11**	**8.9E-11**	**1.2E-10**	**2.4E-11**	**1.2E-10**	**6.3E-12**	**1.3E-10**	**9.3E-12**	**4.3E-11**	**9.6E-11**	**1.2E-10**	**3.0E-11**	**2.2E-10**	**2.5E-12**	**1.3E-10**	**1.7E-12**								

B.3 Air- Inhalation Intake and Dose

Air-INHALATION INTAKE

	100 Area Inh Gv1.485 pCi/y	100 Area Inh Gv2 pCi/yr	100 Area Inh Gv2: Gv1.485 ratio
Am241	2.7E-05	2.3E-05	0.84
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	4.2E-06	3.5E-06	0.84
Pu239	3.2E-05	2.8E-05	0.86
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	4.9E-05	4.2E-05	0.85
Y90	2.0E-06	4.8E-06	2.41

	200 Area Inh Gv1.485 pCi/y	200 Area Inh Gv2 pCi/yr	200 Area Inh Gv2: Gv1.485 ratio
Am241	1.7E-05	5.4E-05	3.16
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	1.4E-04	4.5E-04	3.24
H3	0	0	N/A
I129	5.8E-03	1.9E-02	3.19
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	4.9E-08	1.6E-07	3.20
Pu239	8.9E-05	2.8E-04	3.19
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	4.4E-04	1.4E-03	3.20
Y90	5.2E-06	1.2E-04	23

	300 Area Inh Gv1.485 pCi/y	300 Area Inh Gv2 pCi/yr	300 Area Inh Gv2: Gv1.485 ratio
Am241	8.7E-06	9.5E-06	1.10
Am243	1.5E-06	1.7E-06	1.12
Bi210	5.6E-08	2.3E-10	4.E-03
Bi212	1.9E+00	2.6E+02	138
Cs137	1.1E-04	1.2E-04	1.07
H3	3.7E+04	4.1E+04	1.10
I129	0	0	N/A
Np239	2.3E-09	2.3E-10	0.10
OBT	n/a	0	0/NA
Pb210	1.6E-04	2.3E-10	1.E-06
Pb212	23	25	1.08
Po210	4.8E-13	2.3E-10	473
Pu238	4.4E-06	4.8E-06	1.08
Pu239	8.7E-05	9.5E-05	1.10
Rn220	n/a	1.7E+04	17162/na
Rn222	3.5E+02	3.9E+02	1.13
Sr90	1.2E-03	1.3E-03	1.08
Y90	1.6E-06	2.3E-10	1.E-04

	400 Area Inh Gv1.485 pCi/y	400 Area Inh Gv2 pCi/yr	400 Area Inh Gv2: Gv1.485 ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	1.9E-04	1.6E-04	0.85
H3	3.6E-01	3.0E-01	0.84
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	5.1E-05	4.3E-05	0.84
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A

Air-INHALATION DOSE

	100 Area Inh Gv1.485 rem	100 Area Inh Gv2 rem	100 Area Inh Gv2: Gv1.485 Ratio
Am241	1.2E-08	1.0E-08	0.84
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	1.2E-09	1.0E-09	0.84
Pu239	9.7E-09	8.5E-09	0.88
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	9.9E-12	1.0E-11	1.01
Y90	1.7E-14	4.1E-14	2.39
Total	2.3E-08	2.0E-08	

	200 Area Inh Gv1.485 rem	200 Area Inh Gv2 rem	200 Area Inh Gv2: Gv1.485 Ratio
Am241	7.5E-09	2.4E-08	3.19
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	4.2E-12	1.5E-11	3.45
H3	0	0	N/A
I129	8.8E-10	3.2E-09	3.65
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	1.4E-11	4.5E-11	3.23
Pu239	2.7E-08	8.8E-08	3.24
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	8.9E-11	3.4E-10	3.79
Y90	4.5E-14	1.0E-12	23
Total	3.5E-08	1.2E-07	

	300 Area Inh Gv1.485 rem	300 Area Inh Gv2 rem	300 Area Inh Gv2: Gv1.485 Ratio
Am241	3.9E-09	4.2E-09	1.09
Am243	6.6E-10	7.4E-10	1.12
Bi210	1.1E-14	4.5E-17	4.E-03
Bi212	3.8E-08	5.0E-06	132
Cs137	3.3E-12	3.8E-12	1.14
H3	3.3E-06	2.6E-06	0.79
I129	0	0	N/A
Np239	5.8E-18	5.7E-19	0.10
OBT	n/a	0	0/NA
Pb210	2.2E-09	3.1E-15	1.E-06
Pb212	4.1E-06	4.2.E-06	1.02
Po210	4.1E-18	2.1E-15	520
Pu238	1.3E-09	1.4E-09	1.05
Pu239	2.6E-08	2.9E-08	1.13
Rn220	n/a	0.0E+00	0/NA
Rn222	0.0E+00	0.0E+00	0/0
Sr90	2.4E-10	3.1E-10	1.29
Y90	1.4E-14	1.9E-18	1.E-04
Total	7.5E-06	1.2E-05	

	400 Area Inh Gv1.485 rem	400 Area Inh Gv2 rem	400 Area Inh Gv2: Gv1.485 Ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	5.7E-12	5.1E-12	0.90
H3	3.3E-11	1.9E-11	0.59
I129	0	0	N/A
Np239	0	0	N/A
OBT	n/a	0	0/NA
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	1.5E-08	1.3E-08	0.88
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A
Total	1.5E-08	1.3E-08	

B.4 Air- External Exposure to Plume and Ground Deposition

B.4.1 Air- Plume Exposure and Dose

Air-EXTERNAL PLUME EXPOSURE

	100 Area Ext Plume Gv1.485 pCi/m3	100 Area Ext Plume Gv2 pCi/m3	100 Area Ext Plume Gv2: Gv1.485 ratio
Am241	3.2E-09	2.7E-09	0.83
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	4.9E-10	4.1E-10	0.84
Pu239	3.8E-09	3.2E-09	0.85
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	5.8E-09	4.9E-09	0.84
Y90	2.3E-10	5.6E-10	2.46

	200 Area Ext Plume Gv1.485 pCi/m3	200 Area Ext Plume Gv2 pCi/m3	200 Area Ext Plume Gv2: Gv1.485 ratio
Am241	2.0E-09	6.3E-09	3.16
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	1.7E-08	5.3E-08	3.13
H3	0	0	N/A
I129	6.8E-07	2.2E-06	3.19
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	5.8E-12	1.8E-11	3.17
Pu239	1.0E-08	3.3E-08	3.32
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	5.2E-08	1.7E-07	3.18
Y90	6.1E-10	1.4E-08	23.53

	300 Area Ext Plume Gv1.485 pCi/m3	300 Area Ext Plume Gv2 pCi/m3	300 Area Ext Plume Gv2: Gv1.485 ratio
Am241	1.0E-09	1.1E-09	1.12
Am243	1.8E-10	2.0E-10	1.09
Bi210	6.6E-12	2.7E-14	4.E-03
Bi212	2.2E-04	3.1E-02	140
Cs137	1.3E-08	1.4E-08	1.07
H3	4.4E+00	6.7E+00	1.53
I129	0	0	N/A
Np239	2.7E-13	2.7E-14	0.10
OBT	N/A	0	0/NA
Pb210	1.8E-08	2.7E-14	1.E-06
Pb212	2.7E-03	2.9E-03	1.08
Po210	5.7E-17	2.7E-14	467
Pu238	5.1E-10	5.6E-10	1.10
Pu239	1.0E-08	1.1E-08	1.12
Rn220	N/A	2.01	2.01/NA
Rn222	4.2E-02	4.6E-02	1.11
Sr90	1.4E-07	1.5E-07	1.09
Y90	1.9E-10	2.7E-14	1.E-04

	400 Area Ext Plume Gv1.485 pCi/m3	400 Area Ext Plume Gv2 pCi/m3	400 Area Ext Plume Gv2: Gv1.485 ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	2.3E-08	1.9E-08	0.82
H3	4.3E-05	3.6E-05	0.83
I129	0	0	N/A
Np239	0	0	N/A
OBT	N/A	0	0/na
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	6.0E-09	5.1E-09	0.84
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A

Air-EXTERNAL PLUME DOSE

	100 Area Ext Plume Gv1.485 rem	100 Area Ext Plume Gv2 rem	100 Area Ext Plume Gv2: Gv1.485 Ratio
Am241	2.2E-16	1.8E-16	0.84
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	4.9E-19	4.2E-19	0.85
Pu239	2.6E-18	2.2E-18	0.84
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	7.5E-18	6.4E-18	0.85
Y90	1.1E-17	2.7E-17	2.41
Total	2.4E-16	2.2E-16	

	200 Area Ext Plume Gv1.485 rem	200 Area Ext Plume Gv2 rem	200 Area Ext Plume Gv2: Gv1.485 Ratio
Am241	1.4E-16	4.4E-16	3.12
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	6.2E-14	1.9E-13	3.13
H3	0	0	N/A
I129	3.9E-14	1.2E-13	3.18
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	5.8E-21	1.9E-20	3.21
Pu239	6.7E-18	2.2E-17	3.34
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	6.8E-17	2.2E-16	3.16
Y90	2.9E-17	6.7E-16	23.24
Total	1.0E-13	3.2E-13	

	300 Area Ext Plume Gv1.485 rem	300 Area Ext Plume Gv2 rem	300 Area Ext Plume Gv2: Gv1.485 Ratio
Am241	6.9E-17	7.7E-17	1.12
Am243	3.1E-17	3.4E-17	1.11
Bi210	5.2E-20	2.1E-22	4.E-03
Bi212	2.3E-09	3.2E-07	139
Cs137	4.7E-14	5.0E-14	1.07
H3	3.2E-15	4.7E-15	1.48
I129	0	0	N/A
Np239	2.6E-19	2.6E-20	0.10
OBT	N/A	0	0/NA
Pb210	1.4E-16	2.1E-22	2.E-06
Pb212	2.3E-09	2.4E-09	1.06
Po210	3.3E-27	1.5E-24	464
Pu238	5.1E-19	5.6E-19	1.11
Pu239	6.7E-18	7.5E-18	1.12
Rn220	N/A	4.3E-09	4.E-9/NA
Rn222	5.1E-07	5.6E-07	1.10
Sr90	1.8E-16	2.0E-16	1.09
Y90	8.9E-18	1.3E-21	1.E-04
Total	5.1E-07	8.9E-07	

	400 Area Ext Plume Gv1.485 rem	400 Area Ext Plume Gv2 rem	400 Area Ext Plume Gv2: Gv1.485 Ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	8.4E-14	6.9E-14	0.82
H3	3.1E-20	2.5E-20	0.81
I129	0	0	N/A
Np239	0	0	N/A
OBT	N/A	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	4.0E-18	3.4E-18	0.85
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A
Total	8.4E-14	6.9E-14	

B.4.2 Air- Ground Deposition Exposure and Dose

Air-EXTERNAL SOIL DEPOSITION EXPOSURE

	100 Area Ext Soil Gv1.485 pCi/m2	100 Area Ext Soil Gv2 pCi/m2	100 Area Ext Soil Gv2: Gv1.485 ratio
Am241	5.0E-05	4.0E-05	0.79
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	7.7E-06	6.1E-06	0.80
Pu239	6.0E-05	4.8E-05	0.80
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	9.0E-05	7.2E-05	0.80
Y90	8.9E-05	7.1E-05	0.79

	200 Area Ext Soil Gv1.485 pCi/m2	200 Area Ext Soil Gv2 pCi/m2	200 Area Ext Soil Gv2: Gv1.485 ratio
Am241	3.1E-05	7.0E-05	2.26
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	2.6E-04	5.9E-04	2.25
H3	0	0	N/A
I129	7.4E-02	2.4E-02	0.32
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	9.0E-08	2.0E-07	2.26
Pu239	1.6E-04	3.7E-04	2.30
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	8.0E-04	1.8E-03	2.27
Y90	8.0E-04	1.8E-03	2.23

	300 Area Ext Soil Gv1.485 pCi/m2	300 Area Ext Soil Gv2 pCi/m2	300 Area Ext Soil Gv2: Gv1.485 ratio
Am241	1.6E-05	2.3E-05	1.44
Am243	2.9E-06	4.1E-06	1.40
Bi210	2.8E-04	5.5E-10	2.E-06
Bi212	7.4E-02	2.1E-01	2.87
Cs137	2.0E-04	2.8E-04	1.42
H3	0	0	0/0
I129	0	0	N/A
Np239	2.8E-06	4.0E-06	1.42
OBT	N/A	0	0/na
Pb210	2.8E-04	5.4E-10	2.E-06
Pb212	7.4E-02	2.1E-01	2.87
Po210	1.5E-04	5.5E-10	4.E-06
Pu238	8.1E-06	1.1E-05	1.42
Pu239	1.6E-04	2.3E-04	1.44
Rn220	N/A	0	0/na
Rn222	0	0	0/0
Sr90	2.2E-03	3.1E-03	1.42
Y90	2.1E-03	3.1E-03	1.46

	400 Area Ext Soil Gv1.485 pCi/m2	400 Area Ext Soil Gv2 pCi/m2	400 Area Ext Soil Gv2: Gv1.485 ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	3.5E-04	4.0E-04	1.14
H3	0	0	0/0
I129	0	0	N/A
Np239	0	0	N/A
OBT	N/A	0	0/na
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	9.5E-05	1.1E-04	1.13
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A

Air-EXTERNAL SOIL DEPOSITION DOSE

	100 Area Ext Soil Gv1.485 rem	100 Area Ext Soil Gv2 rem	100 Area Ext Soil Gv2: Gv1.485 Ratio
Am241	1.6E-13	1.3E-13	0.79
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	0	0	N/A
H3	0	0	N/A
I129	0	0	N/A
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	1.9E-15	1.5E-15	0.79
Pu239	6.2E-15	5.0E-15	0.80
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	4.9E-15	3.9E-15	0.79
Y90	1.1E-13	8.5E-14	0.78
Total	**2.8E-13**	**2.2E-13**	

	200 Area Ext Soil Gv1.485 rem	200 Area Ext Soil Gv2 rem	200 Area Ext Soil Gv2: Gv1.485 Ratio
Am241	9.9E-14	2.3E-13	2.27
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	1.9E-11	4.3E-11	2.28
H3	0	0	N/A
I129	2.9E-10	9.5E-11	0.33
Np239	0	0	N/A
OBT	0	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	2.2E-17	5.0E-17	2.27
Pu239	1.7E-14	3.8E-14	2.24
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	4.3E-14	9.9E-14	2.30
Y90	9.7E-13	2.2E-12	2.23
Total	**3.1E-10**	**1.4E-10**	

	300 Area Ext Soil Gv1.485 rem	300 Area Ext Soil Gv2 rem	300 Area Ext Soil Gv2: Gv1.485 Ratio
Am241	5.1E-14	7.4E-14	1.45
Am243	1.9E-14	2.6E-14	1.37
Bi210	6.9E-14	1.4E-19	2.E-06
Bi212	1.2E-08	3.5E-08	2.92
Cs137	1.5E-11	2.1E-11	1.41
H3	0	0	0/0
I129	0	0	N/A
Np239	6.9E-14	9.8E-14	1.42
OBT	N/A	0	0/NA
Pb210	0	4.2E-19	4E-19/0
Pb212	1.5E-09	4.3E-09	2.87
Po210	1.6E-16	6.0E-22	4.E-06
Pu238	2.0E-15	2.8E-15	1.42
Pu239	1.7E-14	2.4E-14	1.41
Rn220	n/a	0	0/NA
Rn222	0	0	0/0
Sr90	1.2E-13	1.7E-13	1.42
Y90	2.5E-12	3.7E-12	1.48
Total	**1.4E-08**	**3.9E-08**	

	400 Area Ext Soil Gv1.485 rem	400 Area Ext Soil Gv2 rem	400 Area Ext Soil Gv2: Gv1.485 Ratio
Am241	0	0	N/A
Am243	0	0	N/A
Bi210	0	0	N/A
Bi212	0	0	N/A
Cs137	2.6E-11	2.9E-11	1.12
H3	0	0	0/0
I129	0	0	N/A
Np239	0	0	N/A
OBT	N/A	0	N/A
Pb210	0	0	N/A
Pb212	0	0	N/A
Po210	0	0	N/A
Pu238	0	0	N/A
Pu239	9.8E-15	1.1E-14	1.13
Rn220	0	0	N/A
Rn222	0	0	N/A
Sr90	0	0	N/A
Y90	0	0	N/A
Total	**2.6E-11**	**2.9E-11**	

B.5 Air- Ratios of GENIIv2 and GENIIv1.485 Results

B.5.1 Air- Terrestrial Food Gv2:v1.485 Ratios

B.5.1.1 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 100 Area Releases

AIR - TERRESTRIAL CROPS - RATIOS SUMMARY FOR 100 AREA RELEASE

	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area
	Air Conc	Ci ing fr LfyVeg	Ci ing fr Roots	Ci ing fr Fruit	Ci ing fr Grain	Dose fr LfyVeg	Dose fr Roots	Dose fr Fruit	Dose fr Grain
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sr90	0.85	1.54	1.19	1.18	1.52	1.79	1.39	1.36	1.77
(Y90)	1.E+06	1.57	1.26	1.23	1.52	see Sr90	see Sr90	see Sr90	see Sr90
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	0.85	1.58	1.59	1.59	1.57	1.63	1.66	1.63	1.63
Pu239	0.85	1.60	1.59	1.58	1.62	1.66	1.65	1.66	1.68
Am241	0.85	1.58	1.58	1.58	1.55	1.60	1.58	1.60	1.55
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

AIR - TERRESTRIAL ANIMAL PRODUCTS - RATIOS SUMMARY FOR 100 AREA RELEASE

	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area	100 Area
	Air Conc	Ci ing fr Meat	Ci ing fr Poultry	Ci ing fr Milk	Ci ing fr Egg	Dose fr Meat	Dose fr Poultry	Dose fr Milk	Dose fr Egg
	Gv2: Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio
H3+OBT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sr90	0.85	1.56	1.53	1.53	1.55	1.82	1.76	1.78	1.80
(Y90)	1.E+06	1.57	0.87	1.48	1.58	see Sr90	see Sr90	see Sr90	see Sr90
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	0.85	1.59	1.53	1.56	1.64	1.64	1.59	1.62	1.70
Pu239	0.85	1.60	1.59	1.59	1.59	1.65	1.64	1.67	1.65
Am241	0.85	1.61	1.58	1.59	1.59	1.63	1.60	1.60	1.59
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

B.5.1.2 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 200 Area Releases

AIR - TERRESTRIAL CROPS - RATIOS SUMMARY FOR 200 AREA RELEASE

	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area
	Air Conc	Ci ing fr LfyVeg	Ci ing fr Roots	Ci ing fr Fruit	Ci ing fr Grain	Dose fr LfyVeg	Dose fr Roots	Dose fr Fruit	Dose fr Grain
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sr90	3.30	4.29	3.36	3.31	4.32	4.98	3.91	3.93	4.94
(Y90)	3.E+07	4.39	3.40	3.53	4.32	see Sr90	see Sr90	see Sr90	see Sr90
I129	3.30	0.44	0.40	0.38	0.41	0.48	0.44	0.41	0.45
Cs137	3.30	4.44	4.33	4.42	4.41	4.69	4.67	4.76	4.66
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	3.30	4.38	4.43	4.40	4.42	4.53	4.60	4.57	4.58
Pu239	3.29	4.37	4.26	4.39	4.40	4.53	4.47	4.61	4.60
Am241	3.29	4.34	4.32	4.43	4.32	4.28	4.31	4.41	4.37
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

AIR - TERRESTRIAL ANIMAL PRODUCTS - RATIOS SUMMARY FOR 200 AREA RELEASE

	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area	200 Area
	Air Conc	Ci ing fr Meat	Ci ing fr Poultry	Ci ing fr Milk	Ci ing fr Egg	Dose fr Meat	Dose fr Poultry	Dose fr Milk	Dose fr Egg
	Gv2: Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio	Gv2:Gv1.485 Ratio
H3+OBT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sr90	3.30	4.22	4.36	4.28	4.36	4.90	5.07	4.95	5.15
(Y90)	3.E+07	4.24	2.34	4.43	4.38	see Sr90	see Sr90	see Sr90	see Sr90
I129	3.30	0.44	0.41	0.44	0.41	0.49	0.47	0.48	0.45
Cs137	3.30	4.56	4.26	4.38	4.35	4.81	4.47	4.58	4.50
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	3.30	4.46	4.34	4.39	4.50	4.65	4.49	4.51	4.68
Pu239	3.29	4.39	4.41	4.42	4.46	4.57	4.54	4.63	4.60
Am241	3.29	4.23	4.46	4.41	4.37	4.28	4.53	4.47	4.45
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

B.5.1.3 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 300 Area Releases

AIR - TERRESTRIAL CROPS - RATIOS SUMMARY FOR 300 AREA RELEASE

	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area
	Air Conc	Ci ing fr LfyVeg	Ci ing fr Roots	Ci ing fr Fruit	Ci ing fr Grain	Dose fr LfyVeg	Dose fr Roots	Dose fr Fruit	Dose fr Grain
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	1.09	1.45	1.25	1.23	1.27	1.52	1.31	1.25	1.36
Sr90	1.09	2.58	2.01	1.96	2.63	3.06	2.34	2.30	3.04
(Y90)	1.09	2.66	2.04	2.07	2.63	see Sr90	see Sr90	see Sr90	see Sr90
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	1.09	2.74	2.57	2.50	2.73	2.90	2.65	2.67	2.90
Rn220	1.12	0/NA	0/NA	0/NA	0/NA	2.41	2.30	2.31	0/0
(Pb212)	1.09	2.64	2.52	2.54	0/0	see Rn220	see Rn220	see Rn220	see Rn220
(Bi212)	1.09	8.E-07	6.E-04	6.E-04	0/0	see Rn220	see Rn220	see Rn220	see Rn220
Rn222	1.12	0/0	0/0	0/0	0/0	5.E-06	5.E-06	4.E-06	4.E-06
(Pb210)	1.09	4.E-06	3.E-06	3.E-06	4.E-06	see Rn222	see Rn222	see Rn222	see Rn222
(Bi210)	1.09	5.E-06	4.E-06	4.E-06	4.E-06	see Rn222	see Rn222	see Rn222	see Rn222
(Po210)	1.09	5.E-05	4.E-05	4.E-05	6.E-06	see Rn222	see Rn222	see Rn222	see Rn222
Pu238	1.09	2.62	2.54	2.50	2.73	2.75	2.63	2.57	2.83
Pu239	1.09	2.59	2.57	2.48	2.70	2.68	2.71	2.54	2.80
Am241	1.09	2.59	2.57	2.48	2.69	2.61	2.63	2.50	2.72
Am243	1.09	2.60	2.50	2.56	2.63	2.62	2.60	2.53	2.63
(Np239)	1.09	2.60	2.40	2.39	2.63	see Am243	see Am243	see Am243	see Am243

AIR - TERRESTRIAL ANIMAL PRODUCTS - RATIOS SUMMARY FOR 300 AREA RELEASE

	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area	300 Area
	Air Conc	Ci ing fr Meat	Ci ing fr Poultry	Ci ing fr Milk	Ci ing fr Egg	Dose fr Meat	Dose fr Poultry	Dose fr Milk	Dose fr Egg
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	1.09	0.71	0.25	0.60	0.24	0.74	0.26	0.63	0.26
Sr90	1.09	2.54	2.64	2.55	2.59	2.90	3.04	2.96	3.01
(Y90)	1.09	2.55	1.47	2.52	2.68	see Sr90	see Sr90	see Sr90	see Sr90
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	1.09	2.65	2.73	2.59	2.79	2.80	2.87	2.72	2.94
Rn220	1.12	0/NA	0/NA	0/NA	0/NA	0/0	0/0	2.34	0/0
(Pb212)	1.09	0/0	0/0	2.58	0/0	see Rn220	see Rn220	see Rn220	see Rn220
(Bi212)	1.09	0/0	0/0	1.E-05	0/0	see Rn220	see Rn220	see Rn220	see Rn220
Rn222	1.12	0/0	0/0	0/0	0/0	6E-06	4E-06	8E-06	4E-06
(Pb210)	1.09	4.E-06	4.E-06	3.E-06	4.E-06	see Rn222	see Rn222	see Rn222	see Rn222
(Bi210)	1.09	4.E-06	4.E-06	5.E-06	4.E-06	see Rn222	see Rn222	see Rn222	see Rn222
(Po210)	1.09	7.E-06	6.E-06	6.E-05	6.E-06	see Rn222	see Rn222	see Rn222	see Rn222
Pu238	1.09	2.62	2.77	2.59	2.68	2.72	2.88	2.69	2.78
Pu239	1.09	2.63	2.66	2.60	2.69	2.72	2.74	2.72	2.78
Am241	1.09	2.63	2.69	2.55	2.67	2.66	2.74	2.54	2.68
Am243	1.09	2.76	2.70	2.59	2.73	2.76	2.69	2.57	2.72
(Np239)	1.09	2.61	2.73	2.52	2.75	seeAm243	see Am243	see Am243	see Am243

B.5.1.4 Air- Terrestrial Food Gv2:Gv1.485 Ratios – 400 Area Releases

AIR - TERRESTRIAL CROPS - RATIOS SUMMARY FOR 400 AREA RELEASE

	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area
	Air Conc	Ci ing fr LfyVeg	Ci ing fr Roots	Ci ing fr Fruit	Ci ing fr Grain	Dose fr LfyVeg	Dose fr Roots	Dose fr Fruit	Dose fr Grain
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	0.84	0.77	0.66	0.69	0.68	0.80	0.70	0.73	0.72
Sr90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Y90)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	0.84	2.16	2.15	2.13	2.22	2.24	2.26	2.22	2.33
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu239	0.84	2.17	2.13	2.15	2.18	2.24	2.22	2.25	2.25
Am241	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

AIR - TERRESTRIAL ANIMAL PRODUCTS - RATIOS SUMMARY FOR 400 AREA RELEASE

	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area	400 Area
	Air Conc	Ci ing fr Meat	Ci ing fr Poultry	Ci ing fr Milk	Ci ing fr Egg	Dose fr Meat	Dose fr Poultry	Dose fr Milk	Dose fr Egg
	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio	Gv2: Gv1.485 Ratio
H3+OBT	0.84	0.39	0.13	0.32	0.14	0.41	0.14	0.33	0.14
Sr90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Y90)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I129	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cs137	0.84	2.12	2.16	2.16	2.21	2.19	2.28	2.27	2.38
Rn220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rn222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu238	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pu239	0.84	2.18	2.26	2.13	2.16	2.28	2.37	2.20	2.27
Am241	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Am243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

B.5.2 Air- Inhalation Gv2:Gv1.485 Ratios

	100 Area Air Conc Gv2:Gv1.485 Ratio	100 Area Intake Gv2:Gv1.485 Ratio	100 Area Dose Gv2:Gv1.485 Ratio
H3	N/A	N/A	N/A
Sr90	0.85	0.85	1.01
Y90	1.E+06	2.41	2.39
I129	N/A	N/A	N/A
Cs137	N/A	N/A	N/A
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	0.85	0.84	0.84
Pu239	0.85	0.86	0.88
Am241	0.85	0.84	0.84
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	200 Area Air Conc Gv2:Gv1.485 Ratio	200 Area Intake Gv2:Gv1.485 Ratio 100 Area	200 Area Dose Gv2:Gv1.485 Ratio 100 Area
H3	N/A	N/A	N/A
Sr90	3.30	3.20	3.79
(Y90)	3.E+07	23	23
I129	3.30	3.19	3.65
Cs137	3.30	3.24	3.45
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	3.30	3.20	3.23
Pu239	3.29	3.19	3.24
Am241	3.29	3.16	3.19
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	300 Area Air Conc Gv2:Gv1.485 Ratio	300 Area Intake Gv2:Gv1.485 Ratio 100 Area	300 Area Dose Gv2:Gv1.485 Ratio 100 Area
H3	1.09	1.10	0.79
Sr90	1.09	1.08	1.29
(Y90)	1.09	1.E-04	1.E-04
I129	N/A	N/A	N/A
Cs137	1.09	1.07	1.14
Rn220	1.12	2.E+4 /NA	0/NA
(Pb212)	1.09	1.08	1.02
(Bi212)	1.09	138	132
Rn222	1.12	1.13	0/0
(Pb210)	1.09	1.E-06	1.E-06
(Bi210)	1.09	4.E-03	4.E-03
(Po210)	1.09	473	520
Pu238	1.09	1.08	1.05
Pu239	1.09	1.10	1.13
Am241	1.09	1.10	1.09
Am243	1.09	1.12	1.12
(Np239)	1.09	0.10	0.10

	400 Area Air Conc Gv2:Gv1.485 Ratio	400 Area Intake Gv2:Gv1.485 Ratio 100 Area	400 Area Dose Gv2:Gv1.485 Ratio 100 Area
H3	0.84	0.84	0.59
Sr90	N/A	N/A	N/A
(Y90)	N/A	N/A	N/A
I129	N/A	N/A	N/A
Cs137	0.84	0.85	0.90
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	N/A	N/A	N/A
Pu239	0.84	0.84	0.88
Am241	N/A	N/A	N/A
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

B.5.3 Air- External Exposure Gv2:Gv1.485 Ratios

AIR - PLUME EXTERNAL - RATIOS SUMMARY

	100 Area	100 Area	100 Area
	Air Conc	Air conc_t	Dose ext air
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	N/A	N/A	N/A
Sr90	0.85	0.84	0.85
Y90	1.E+06	2.46	2.41
I129	N/A	N/A	N/A
Cs137	N/A	N/A	N/A
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	0.85	0.84	0.85
Pu239	0.85	0.85	0.84
Am241	0.85	0.83	0.84
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	200 Area	200 Area	200 Area
	Air Conc	Air conc_t	Dose ext air
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	N/A	N/A	N/A
Sr90	3.30	3.18	3.16
Y90	3.E+07	24	23
I129	3.30	3.19	3.18
Cs137	3.30	3.13	3.13
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	3.30	3.17	3.21
Pu239	3.29	3.32	3.34
Am241	3.29	3.16	3.12
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	300 Area	300 Area	300 Area
	Air Conc	Air conc_t	Dose ext air
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	1.09	1.53	1.48
Sr90	1.09	1.09	1.09
Y90	1.09	1.E-04	1.E-04
I129	N/A	N/A	N/A
Cs137	1.09	1.07	1.07
Rn220	1.12	2.01	4.E-9 /NA
(Pb212)	1.09	1.08	1.06
(Bi212)	1.09	140	139
Rn222	1.12	1.11	1.10
(Pb210)	1.09	1.E-06	2.E-06
(Bi210)	1.09	4.E-03	4.E-03
(Po210)	1.09	467	464
Pu238	1.09	1.10	1.11
Pu239	1.09	1.12	1.12
Am241	1.09	1.12	1.12
Am243	1.09	1.09	1.11
(Np239)	1.09	0.10	0.10

	400 Area	400 Area	400 Area
	Air Conc	Air conc_t	Dose ext air
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.48 5 Ratio
H3	0.84	0.83	0.81
Sr90	N/A	N/A	N/A
Y90	N/A	N/A	N/A
I129	N/A	N/A	N/A
Cs137	0.84	0.82	0.82
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	N/A	N/A	N/A
Pu239	0.84	0.84	0.85
Am241	N/A	N/A	N/A
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

AIR - SOIL DEPOSITION EXTERNAL - RATIOS SUMMARY

	100 Area	100 Area	100 Area
	Air Conc	Aerial Activity	Dose ext Ground
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	N/A	N/A	N/A
Sr90	0.85	0.80	0.79
Y90	1.E+06	0.79	0.78
I129	N/A	N/A	N/A
Cs137	N/A	N/A	N/A
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	0.85	0.80	0.79
Pu239	0.85	0.80	0.80
Am241	0.85	0.79	0.79
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	200 Area	200 Area	200 Area
	Air Conc	Aerial Activity	Dose ext Ground
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	N/A	N/A	N/A
Sr90	3.30	2.27	2.30
Y90	3.E+07	2.23	2.23
I129	3.30	0.32	0.33
Cs137	3.30	2.25	2.28
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	3.30	2.26	2.27
Pu239	3.29	2.30	2.24
Am241	3.29	2.26	2.27
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

	300 Area	300 Area	300 Area
	Air Conc	Aerial Activity	Dose ext Ground
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio
H3	1.09	0/0	0/0
Sr90	1.09	1.42	1.42
Y90	1.09	1.46	1.48
I129	N/A	N/A	N/A
Cs137	1.09	1.42	1.41
Rn220	1.12	0.00	0/NA
(Pb212)	1.09	2.87	2.87
(Bi212)	1.09	2.87	2.92
Rn222	1.12	0/0	0/0
(Pb210)	1.09	0.00	0.00
(Bi210)	1.09	0.00	0.00
(Po210)	1.09	0.00	0.00
Pu238	1.09	1.42	1.42
Pu239	1.09	1.44	1.41
Am241	1.09	1.44	1.45
Am243	1.09	1.40	1.37
(Np239)	1.09	1.42	1.42

	400 Area	400 Area	400 Area
	Air Conc	Aerial Activity	Dose ext Ground
	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.4 85 Ratio	Gv2:Gv1.48 5 Ratio
H3	0.84	0/0	0/0
Sr90	N/A	N/A	N/A
Y90	N/A	N/A	N/A
I129	N/A	N/A	N/A
Cs137	0.84	1.14	1.12
Rn220	N/A	N/A	N/A
(Pb212)	N/A	N/A	N/A
(Bi212)	N/A	N/A	N/A
Rn222	N/A	N/A	N/A
(Pb210)	N/A	N/A	N/A
(Bi210)	N/A	N/A	N/A
(Po210)	N/A	N/A	N/A
Pu238	N/A	N/A	N/A
Pu239	0.84	1.13	1.13
Am241	N/A	N/A	N/A
Am243	N/A	N/A	N/A
(Np239)	N/A	N/A	N/A

B.6 Air- Dose Summary

B.6.1 Air- Terrestrial Food Dose Summary

Air-TERRESTRIAL FOOD INGESTION

	100 Area	100 Area	100 Area	100 Area
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3				
Sr90	7.0E-11	9.9E-11	**10.88%**	**9.73%**
Y90	0	6.2E-12	0.00%	**0.61%**
I129				
Cs137				
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238	1.2E-12	1.9E-12	**0.18%**	**0.19%**
Pu239	9.3E-12	1.5E-11	**1.44%**	**1.51%**
Am241	5.7E-10	9.0E-10	**88%**	**88%**
Am243				
(Np239)				
TOT dose	**6.5E-10**	**1.0E-09**	**100%**	**100%**

Air-TERRESTRIAL FOOD INGESTION

	200 Area	200 Area	200 Area	200 Area
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3				
Sr90	6.2E-10	2.5E-09	**0.27%**	**2.24%**
Y90	0	1.6E-10	0.00%	**0.14%**
I129	2.3E-07	1.1E-07	**99.50%**	**95.51%**
Cs137	1.4E-10	6.6E-10	**0.06%**	**0.59%**
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238	1.4E-14	6.2E-14	0.00%	0.00%
Pu239	2.6E-11	1.2E-10	**0.01%**	**0.11%**
Am241	3.6E-10	1.6E-09	**0.16%**	**1.41%**
Am243				
(Np239)				
TOT dose	**2.3E-07**	**1.1E-07**	**100%**	**100%**

Air-TERRESTRIAL FOOD INGESTION

	All Areas	All Areas	All Areas	All Areas
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	3.2E-05	3.3E-05	**99.2%**	**99.6%**
Sr90	2.4E-09	6.6E-09	**0.01%**	**0.02%**
Y90	0	4.1E-10	0.00%	0.00%
I129	2.3E-07	1.1E-07	**0.71%**	**0.32%**
Cs137	4.4E-10	1.4E-09	0.00%	0.00%
Rn220	1.0E-08	0	**0.03%**	0.00%
(Pb212)	0	2.5E-08	**0.00%**	**0.07%**
(Bi212)	0	2.4E-16	0.00%	0.00%
Rn222	5.6E-09	0	**0.02%**	0.00%
(Pb210)	0	1.7E-14	0.00%	0.00%
(Bi210)	0	2.5E-17	0.00%	0.00%
(Po210)	0	7.7E-15	0.00%	0.00%
Pu238	2.4E-12	5.2E-12	0.00%	0.00%
Pu239	7.6E-11	2.3E-10	0.00%	0.00%
Am241	1.1E-09	3.0E-09	0.00%	**0.01%**
Am243	3.2E-11	8.4E-11	0.00%	0.00%
(Np239)	0	7.5E-14	0.00%	0.00%
TOT dose	**3.3E-05**	**3.3E-05**	**100%**	**100%**

Air-TERRESTRIAL FOOD INGESTION

	300 Area	300 Area	300 Area	300 Area
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	3.2E-05	3.3E-05	**99.95%**	**99.91%**
Sr90	1.7E-09	4.0E-09	**0.01%**	**0.01%**
Y90	0	2.5E-10	0.00%	0.00%
I129				
Cs137	1.1E-10	3.0E-10	0.00%	0.00%
Rn220	1.0E-08	0	**0.03%**	0.00%
(Pb212)	0	2.5E-08	0.00%	**0.07%**
(Bi212)	0	2.4E-16	0.00%	0.00%
Rn222	5.6E-09	0	**0.02%**	0.00%
(Pb210)	0	1.7E-14	0.00%	0.00%
(Bi210)	0	2.5E-17	0.00%	0.00%
(Po210)	0	7.7E-15	0.00%	0.00%
Pu238	1.2E-12	3.2E-12	0.00%	0.00%
Pu239	2.5E-11	6.8E-11	0.00%	0.00%
Am241	1.8E-10	4.8E-10	0.00%	0.00%
Am243	3.2E-11	8.4E-11	0.00%	0.00%
(Np239)	0	7.5E-14	0.00%	0.00%
TOT dose	**3.2E-05**	**3.3E-05**	**100%**	**100%**

Air-TERRESTRIAL FOOD INGESTION

	400 Area	400 Area	400 Area	400 Area
	Gv1.485	Gv2	Gv1.485	Gv2
	rem	rem	%total	%total
H3	3.1E-10	1.8E-10	**59.75%**	**27.19%**
Sr90				
Y90				
I129				
Cs137	2.0E-10	4.4E-10	**37.41%**	**67.65%**
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238				
Pu239	1.5E-11	3.3E-11	**2.83%**	**5.16%**
Am241				
Am243				
(Np239)				
TOT dose	**5.3E-10**	**6.5E-10**	**100%**	**100%**

B.6.2 Air- Inhalation Dose Summary

AIR-INHALATION

	100 Area Gv1.485 rem	100 Area Gv2 rem	100 Area Gv1.485 %total	100 Area Gv2 %total
H3				
Sr90	9.9E-12	1.0E-11	0.04%	0.05%
Y90	1.7E-14	4.1E-14	0.00%	0.00%
I129				
Cs137				
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238	1.2E-09	1.0E-09	5.24%	5.15%
Pu239	9.7E-09	8.5E-09	42.3%	43.3%
Am241	1.2E-08	1.0E-08	52.4%	51.5%
Am243				
(Np239)				
TOT dose	2.3E-08	2.0E-08	100%	100%

AIR-INHALATION

	200 Area Gv1.485 rem	200 Area Gv2 rem	200 Area Gv1.485 %total	200 Area Gv2 %total
H3				
Sr90	8.9E-11	3.4E-10	0.25%	0.29%
Y90	4.5E-14	1.0E-12	0.00%	0.00%
I129	8.8E-10	3.2E-09	2.48%	2.79%
Cs137	4.2E-12	1.5E-11	0.01%	0.01%
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238	1.4E-11	4.5E-11	0.04%	0.04%
Pu239	2.7E-08	8.8E-08	76.1%	76.1%
Am241	7.5E-09	2.4E-08	21.1%	20.8%
Am243				
(Np239)				
TOT dose	3.5E-08	1.2E-07	100%	100%

AIR-INHALATION

	ALL Areas Gv1.485 rem	ALL Areas Gv2 rem	ALL Areas Gv1.485 %total	ALL Areas Gv2 %total
H3	3.3E-06	2.6E-06	43.7%	21.7%
Sr90	3.4E-10	6.6E-10	0.00%	0.01%
Y90	7.6E-14	1.1E-12	0.00%	0.00%
I129	8.8E-10	3.2E-09	0.01%	0.03%
Cs137	1.3E-11	2.3E-11	0.00%	0.00%
Rn220	N/A	0	N/A	0.00%
(Pb212)	4.1E-06	4.2E-06	54.3%	35.0%
(Bi212)	3.8E-08	5.0E-06	0.50%	41.78%
Rn222	0	0	0.00%	0.00%
(Pb210)	2.2E-09	3.1E-15	0.03%	0.00%
(Bi210)	1.1E-14	4.5E-17	0.00%	0.00%
(Po210)	4.1E-18	2.1E-15	0.00%	0.00%
Pu238	2.5E-09	2.4E-09	0.03%	0.02%
Pu239	7.8E-08	1.4E-07	1.03%	1.15%
Am241	2.3E-08	3.8E-08	0.31%	0.32%
Am243	6.6E-10	7.4E-10	0.01%	0.01%
(Np239)	5.8E-18	5.7E-19	0.00%	0.00%
TOT dose	7.5E-06	1.2E-05	100%	100%

AIR-INHALATION

	300 Area Gv1.485 rem	300 Area Gv2 rem	300 Area Gv1.485 %total	300 Area Gv2 %total
H3	3.3E-06	2.6E-06	44.2%	22.0%
Sr90	2.4E-10	3.1E-10	0.00%	0.00%
Y90	1.4E-14	1.9E-18	0.00%	0.00%
I129				
Cs137	3.3E-12	3.8E-12	0.00%	0.00%
Rn220	n/a	0	n/a	0.00%
(Pb212)	4.1E-06	4.2E-06	54.9%	35.4%
(Bi212)	3.8E-08	5.0E-06	0.51%	42.31%
Rn222	0	0	0.00%	0.00%
(Pb210)	2.2E-09	3.1E-15	0.03%	0.00%
(Bi210)	1.1E-14	4.5E-17	0.00%	0.00%
(Po210)	4.1E-18	2.1E-15	0.00%	0.00%
Pu238	1.3E-09	1.4E-09	0.02%	0.01%
Pu239	2.6E-08	2.9E-08	0.35%	0.25%
Am241	3.9E-09	4.2E-09	0.05%	0.04%
Am243	6.6E-10	7.4E-10	0.01%	0.01%
(Np239)	5.8E-18	5.7E-19	0.00%	0.00%
TOT dose	7.5E-06	1.2E-05	100%	100%

AIR-INHALATION

	400 Area Gv1.485 rem	400 Area Gv2 rem	400 Area Gv1.485 %total	400 Area Gv2 %total
H3	3.3E-11	1.9E-11	0.22%	0.15%
Sr90				
Y90				
I129				
Cs137	5.7E-12	5.1E-12	0.04%	0.04%
Rn220				
(Pb212)				
(Bi212)				
Rn222				
(Pb210)				
(Bi210)				
(Po210)				
Pu238				
Pu239	1.5E-08	1.3E-08	99.7%	99.8%
Am241				
Am243				
(Np239)				
TOT dose	1.5E-08	1.3E-08	100%	100%

B.6.3 Air- External Exposure Dose Summary

AIR-EXTERNAL PLUME

	Ext Plume 100 Area Gv1.485 rem	Ext Plume 100 Area Gv2 rem	Ext Plume 200 Area Gv1.485 rem	Ext Plume 200 Area Gv2 rem	Ext Plume 300 Area Gv1.485 rem	Ext Plume 300 Area Gv2 rem	Ext plume 400 Area Gv1.485 rem	Ext plume 400 Area Gv2 rem
H3					3.2E-15	4.7E-15	3.1E-20	2.5E-20
Sr90	7.5E-18	6.4E-18	6.8E-17	2.2E-16	1.8E-16	2.0E-16		
Y90	1.1E-17	2.7E-17	2.9E-17	6.7E-16	8.9E-18	1.3E-21		
I129			3.9E-14	1.2E-13				
Cs137			6.2E-14	1.9E-13	4.7E-14	5.0E-14	8.4E-14	6.9E-14
Rn220					n/a	4.3E-09		
(Pb212)					2.3E-09	2.4E-09		
(Bi212)					2.3E-09	3.2E-07		
Rn222					5.1E-07	5.6E-07		
(Pb210)					1.4E-16	2.1E-22		
(Bi210)					5.2E-20	2.1E-22		
(Po210)					3.3E-27	1.5E-24		
Pu238	4.9E-19	4.2E-19	5.8E-21	1.9E-20	5.1E-19	5.6E-19		
Pu239	2.6E-18	2.2E-18	6.7E-18	2.2E-17	6.7E-18	7.5E-18	4.0E-18	3.4E-18
Am241	2.2E-16	1.8E-16	1.4E-16	4.4E-16	6.9E-17	7.7E-17		
Am243					3.1E-17	3.4E-17		
(Np239)					2.6E-19	2.6E-20		
TOT dose	**2.4E-16**	**2.2E-16**	**1.0E-13**	**3.2E-13**	**5.1E-07**	**8.9E-07**	**8.4E-14**	**6.9E-14**

AIR-EXTERNAL PLUME

	Ext Plume ALL Areas Gv1.485 rem	Ext Plume ALL Areas Gv2 rem	Ext Plume ALL Areas Gv1.485 %total	Ext Plume ALL Areas Gv2 %total
H3	3.2E-15	4.7E-15	0.00%	0.00%
Sr90	2.6E-16	4.2E-16	0.00%	0.00%
Y90	4.9E-17	7.0E-16	0.00%	0.00%
I129	3.9E-14	1.24E-13	0.00%	0.00%
Cs137	1.9E-13	3.1E-13	0.00%	0.00%
Rn220	N/A	4.3E-09	N/A	**0.49%**
(Pb212)	2.3E-09	2.4E-09	**0.45%**	**0.27%**
(Bi212)	2.3E-09	3.2E-07	**0.45%**	**35.9%**
Rn222	5.1E-07	5.6E-07	**99.1%**	**63.3%**
(Pb210)	1.4E-16	2.1E-22	0.00%	0.00%
(Bi210)	5.2E-20	2.1E-22	0.00%	0.00%
(Po210)	3.3E-27	1.5E-24	0.00%	0.00%
Pu238	1.0E-18	1.0E-18	0.00%	0.00%
Pu239	2.0E-17	3.6E-17	0.00%	0.00%
Am241	4.3E-16	7.0E-16	0.00%	0.00%
Am243	3.1E-17	3.4E-17	0.00%	0.00%
(Np239)	2.6E-19	2.6E-20	0.00%	0.00%
TOT dose	**5.1E-07**	**8.9E-07**	**100%**	**100%**

AIR-EXTERNAL SOIL DEPOSITION

	Ext Soil 100 Area Gv1.485 rem	Ext Soil 100 Area Gv2 rem	Ext Soil 200 Area Gv1.485 rem	Ext Soil 200 Area Gv2 rem	Ext Soil 300 Area Gv1.485 rem	Ext Soil 300 Area Gv2 rem	Ext Soil 400 Area Gv1.485 rem	Ext Soil 400 Area Gv2 rem
H3							0.0E+00	0.0E+00
Sr90	4.9E-15	3.9E-15	4.3E-14	9.9E-14	1.2E-13	1.7E-13		
Y90	1.1E-13	8.5E-14	9.7E-13	2.2E-12	2.5E-12	3.7E-12		
I129			2.9E-10	9.5E-11				
Cs137			1.9E-11	4.3E-11	1.5E-11	2.1E-11	2.6E-11	2.9E-11
Rn220					n/a	0.0E+00		
(Pb212)					1.5E-09	4.3E-09		
(Bi212)					1.2E-08	3.5E-08		
Rn222					0.0E+00	0.0E+00		
(Pb210)					0.0E+00	4.2E-19		
(Bi210)					6.9E-14	1.4E-19		
(Po210)					1.6E-16	6.0E-22		
Pu238	1.9E-15	1.5E-15	2.2E-17	5.0E-17	2.0E-15	2.8E-15		
Pu239	6.2E-15	5.0E-15	1.7E-14	3.8E-14	1.7E-14	2.4E-14	9.8E-15	1.1E-14
Am241	1.6E-13	1.3E-13	9.9E-14	2.3E-13	5.1E-14	7.4E-14		
Am243					1.9E-14	2.6E-14		
(Np239)					6.9E-14	9.8E-14		
TOT dose	**2.8E-13**	**2.2E-13**	**3.1E-10**	**1.4E-10**	**1.4E-08**	**3.9E-08**	**2.6E-11**	**2.9E-11**

AIR-EXTERNAL SOIL DEPOSITION

	Ext Soil ALL Areas Gv1.485 rem	Ext Soil ALL Areas Gv2 rem	Ext Soil ALL Areas Gv1.485 %total	Ext Soil ALL Areas Gv2 %total
H3	0	0	0.00%	0.00%
Sr90	1.7E-13	2.7E-13	0.00%	0.00%
Y90	3.6E-12	6.0E-12	**0.03%**	**0.02%**
I129	2.9E-10	9.51E-11	**2.09%**	**0.24%**
Cs137	6.0E-11	9.4E-11	**0.43%**	**0.24%**
Rn220	N/A	0	N/A	0.00%
(Pb212)	1.5E-09	4.3E-09	**10.8%**	**10.9%**
(Bi212)	1.2E-08	3.5E-08	**86.6%**	**88.6%**
Rn222	0	0	0.00%	0.00%
(Pb210)	0	4.2E-19	0.00%	0.00%
(Bi210)	6.9E-14	1.4E-19	0.00%	0.00%
(Po210)	1.6E-16	6.0E-22	0.00%	0.00%
Pu238	3.9E-15	4.4E-15	0.00%	0.00%
Pu239	5.0E-14	7.8E-14	0.00%	0.00%
Am241	3.1E-13	4.3E-13	0.00%	0.00%
Am243	1.9E-14	2.6E-14	0.00%	0.00%
(Np239)	6.9E-14	9.8E-14	0.00%	0.00%
TOT dose	**1.4E-08**	**3.9E-08**	**100%**	**100%**

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