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9                   **Appendix F**

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13                   **Methods for Evaluating Impacts on Health from**  
14                   **Radionuclides and Chemicals**

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**Appendix F**

5           **Methods for Evaluating Impacts on Health from**  
6           **Radionuclides and Chemicals**

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9     This appendix describes details of the methodology used to evaluate health impacts for the  
10 alternatives considered in the Hanford Site Solid (Radioactive and Hazardous) Waste Program  
11 Environmental Impact Statement (HSW EIS). Unless otherwise specified, the data used for the analysis  
12 are provided in the Technical Information Document prepared by Fluor Hanford (FH 2003), the Solid  
13 Waste Information Tracking System (SWITS) database (Anderson and Hagel 1996; Hagel 1999;  
14 FH 2003), or the Solid Waste Integrated Forecast Technical (SWIFT) Report (Barcot 1999, 2002).

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16       **F.1 Normal Operation Impact Assessment Methods**

17  
18     Under normal waste management operations, atmospheric releases of radionuclides and chemicals  
19 could occur. This section describes methods used to estimate annual quantities released, atmospheric  
20 transport, exposure scenarios, and health impacts assessment of these releases.

21  
22     The methods used are based on source and waste stream information presented in Section 3 and on  
23 the affected environment from Section 4. The atmospheric transport and health impacts were evaluated  
24 using the Multimedia Environmental Pollutant Assessment System (MEPAS) Version 4.0 (Droppo and  
25 Buck 1996; Strenge and Chamberlain 1995). This version is an enhancement of earlier versions (for  
26 instance, Version 3.1 [Buck et al. 1995] and Version 3.2 [Buck et al. 1997]) and is designed to operate  
27 under the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) described by  
28 Whelan et al. (1997). The MEPAS program was selected because it is capable of evaluating health  
29 impacts from radionuclides and chemicals, and it can model time-varying releases, deposition, and  
30 accumulation in soil. Doses to hypothetical maximally exposed individuals (MEIs) are intended to bound  
31 potential impacts but not to reflect an expected set of typical circumstances.

32  
33     The atmospheric dispersion models in the MEPAS program provide nearly identical results to those  
34 generated using the U.S. Environmental Protection Agency (EPA) CAP88 program, as verified in a  
35 benchmarking study performed on the MEPAS, MMSOILS, and RESRAD computer programs  
36 (Mills et al. 1997). The RESRAD program uses the CAP88 program for atmospheric transport  
37 calculations (Cheng et al. 1995).

38  
39       **F.1.1 Pollutant Releases to the Atmosphere**

40  
41     Pollutant releases to the atmosphere may occur from any of the facilities handling or containing any  
42 of the several waste streams identified for this HSW EIS, as described in Section 2. The release rate must

1 be evaluated as a function of time during the period of operation because the volumes of waste processed  
2 vary by year. For a given facility and year, the annual release is determined by the quantity of waste  
3 processed or stored in the facility during the year, the average concentration of each pollutant in the waste  
4 while in the facility, and the fraction of the pollutant that is released to the atmosphere. The annual  
5 release from a given facility can be expressed in Equation F.1.  
6

$$R_i = \sum_{i=1}^n V C_i F_i \quad (F.1)$$

7 where  $R_i$  = release rate of pollutant  $i$  from a facility during a given year (Ci/yr or kg/yr)  
8

9  $V$  = volume of waste stream processed in a facility ( $m^3/yr$ )  
10

11  $C_i$  = average concentration of pollutant  $i$  in a waste stream ( $Ci/m^3$  or  $kg/m^3$ )  
12

13  $F_i$  = release fraction for pollutant  $i$  from a waste stream processed in a given facility  
(dimensionless)  
14

15  $n$  = number of waste streams processed in the facility.

16 The waste stream volumes are described in Section 2 and in Appendixes B and C. Table F.1 is a  
17 cross-reference for Tables F.2 through F.18, which provide concentration data for each waste stream for  
18 each alternative. The presumed average concentration of constituents in each waste stream is provided in  
19 Tables F.2 through F.18. Waste stream designations are given in Appendix B. The radionuclides  
20 included in each waste stream are those that contribute greater than 0.1 percent to inhalation or ingestion  
21 dose based on the concentration in the given waste stream. Short-lived radionuclides that are generated  
22 from a longer-lived radionuclide (for example, yttrium-90 from strontium-90) in the inventory are not  
23 included in the lists because their contributions are included with the parent radionuclide in the dose  
24 analysis.

25 The analysis of health impacts is performed for each facility using the facility release characteristics  
26 (for example, stack height and exit velocity) and annual release rates as input to the atmospheric transport  
27 analysis. The transport and exposure pathway analyses evaluate downwind transport, deposition, soil  
28 resuspension, soil accumulation, and transfer through exposure pathways to the exposed individuals.  
29

30 The release fractions have been defined for each facility and pollutant using information and methods  
31 from past analyses. Facilities not included in the list are not expected to release contaminants under  
32 normal operating conditions.  
33

34 Release fractions were estimated for each facility managing wastes that are evaluated within the  
35 scope of this HSW EIS. These facilities and the waste streams associated with each facility are described  
36 in Section 2 and Appendixes B and C. Generally, the release fraction estimation is based on previous  
37 studies involving the existing facilities or on values for similar facilities. Guidance from 40 CFR 61,  
38 Appendix D (consistent with WAC 246-247), also is used for release fraction estimates for the Waste  
39

1                   **Table F.1.** Summary of Waste Stream Concentration Tables

2

<b>Stream No.<sup>(a)</sup></b>	<b>Waste Stream Description<sup>(b)</sup></b>	<b>Table Number</b>
1	LLW Cat 1	F.2
2	LLW Cat 3	F.3
1 and 2	LLW from Offsite	F.4
2c2	LLW Cat 3 for T Plant Processing from Offsite	F.5
4	TRU-RH Waste in Trenches	F.6
4	TRU-CH Waste in Trenches	F.7
5	TRU-CH Waste in Caissons	F.8
8	TRU Waste Containing PCBs	F.9
9	TRU-RH and -CH Drums and SWBs	F.10
10	TRU-CH Boxes	F.10
10	RH-TRU Waste Boxes	F.11
11	MLLW-Treated Ready for Disposal	F.12
12	MLLW-RH and Large Boxes	F.13
13	MLLW-CH	F.14
14	Elemental Lead	F.15
15	Elemental Mercury	F.16
17	K Basin Sludge	F.17
18	Leachate from MLLW Trenches	F.18

(a) Waste stream designations are as described in Appendix B.  
 (b) Cat = Category; CH = contact-handled; LLW = low-level waste;  
       MLLW = mixed low-level waste; PCBs = polychlorinated biphenyls;  
       RH = remote-handled; SWB = standard waste box; TRU = transuranic.

3  
 4 Receiving and Processing Facility (WRAP), the T Plant Complex, the new waste processing facility,  
 5 and leachate treatment by pulse driers. That guidance includes the following conventions:

- 6
- 7     1. Radioactive materials in sealed packages that remain unopened and have not leaked during the  
 8       assessment period were not included in the calculation.
- 9
- 10    2. The release fraction for gaseous material is 1.
- 11
- 12    3. The release fraction for liquids and particulate solids is 0.001.
- 13
- 14    4. The release fraction for solids is 1E-06.
- 15
- 16    5. Credit can be taken for particulate filtration installed between the place of use and the point of release  
 17       (except for gaseous radionuclides).

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**Table F.2.** Stream 1 – Low-Level Waste Category 1

Constituent	Concentration, Ci/m <sup>3</sup>
Americium-241	6.41E-06
Cobalt-60	1.07E-03
Cesium-137	1.01E-04
Iron-55	2.46E-03
Manganese-54	3.29E-03
Nickel-63	8.62E-04
Plutonium-238	2.16E-06
Plutonium-239	3.11E-05
Plutonium-240	7.87E-06
Plutonium-241	2.11E-04
Strontium-90	1.20E-04
Tritium	4.49E+00

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**Table F.3.** Stream 2 – Low-Level Waste Category 3

Constituent	Concentration, Ci/m <sup>3</sup>
Americium-241	7.94E-03
Curium-244	1.00E-03
Cesium-137	9.77E+00
Plutonium-238	1.97E-03
Plutonium-239	9.44E-03
Plutonium-240	3.73E-03
Plutonium-241	2.23E-01
Strontium-90	1.24E+01
Tritium	1.62E-03
Uranium-234	1.89E-02
Uranium-235	5.40E-04
Uranium-236	2.44E-03
Uranium-238	3.04E-02

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**Table F.4.** Streams 1 and 2 – Low-Level Waste from Offsite Sources

Radionuclide	Source Site <sup>(a)</sup> and Waste Stream Concentrations, Ci/m <sup>3</sup>											
	BNL	GE VAL	GJPO	INEEL	ITRI	LLNL	ORR	PNTX	RFETS	SNL	SPRU	WV
Tritium	9.66E-05			6.66E+01	1.73E-02	6.97E-03	8.60E+0	5.81E-04	2.47E-05	1.14E+0	1.45E-04	4.80E-01
Carbon-14				2.31E-03	2.92E-03	1.73E-06	4.30E-05			4.07E-04	1.32E-11	4.07E-04
Cobalt-60	1.41E-06	6.18 <sup>E</sup> -04		8.17E+01			3.21E-02			9.50E-01	7.04E-05	9.50E-01
Nickel-59				4.39E-01			1.41E-07			4.70E-03	8.72E-08	4.70E-03
Nickel-63				1.56E+01			5.76E-01			2.12E-01	3.81E-06	2.12E-01
Strontium-90	3.39E-04	3.14 <sup>E</sup> -03		1.14E-02			2.29E-03		4.74E-11	2.53E-01	4.23E-04	2.53E-01
Technetium-99				1.40E-05			2.56E-07			4.19E-05	9.57E-10	4.19E-05
Cesium-137	5.52E-04	2.18 <sup>E</sup> -03	5.52E-14	2.20E-01			2.17E-01		1.70E-08	1.68E-01	6.80E-04	1.68E-01
Uranium-234	7.52E-08			3.08E-06			1.59E-04	7.36E-06	3.15E-07	1.41E-04	3.61E-06	1.41E-04
Uranium-235	2.66E-08			4.36E-05			7.21E-04	1.26E-06	9.47E-11	7.14E-06	1.67E-07	7.14E-06
Uranium-238	5.76E-08			1.88E-03	5.84E-04	4.96E-04	7.85E-05	7.89E-05	2.68E-07	3.27E-04	1.17E-05	3.27E-04
(a) BNL = Brookhaven National Laboratory GE Val = General Electric – Vallecitos GJPO = Grand Junction Project Office INEEL = Idaho National Engineering and Environmental Laboratory ITRI = Inhalation Toxicology Research Institute LLNL = Lawrence Livermore National Laboratory												
ORR = Oak Ridge Reservation PNTX = Pantex Facility RFETS = Rocky Flats Environmental Technology Site SNL = Sandia National Laboratories SPRU = Separations Process Research Unit WV = West Valley Nuclear Services												

F.5

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**Table F.5.** Stream 2c2 – Low-Level Waste Category 3 Offsite Sources for T Plant Processing

<b>Radionuclide</b>	<b>Source Site<sup>(a)</sup> and Waste Stream Concentrations, Ci/m<sup>3</sup></b>											
	<b>BNL</b>	<b>GE VAL</b>	<b>GJPO</b>	<b>INEEL</b>	<b>ITRI</b>	<b>LLNL</b>	<b>ORR</b>	<b>PNTX</b>	<b>RFETS</b>	<b>SNL</b>	<b>SPRU</b>	<b>WV</b>
Tritium	3.06E-05			2.11E+01	5.48E-03	2.20E-03	2.73E+0	1.84E-04	7.82E-06	3.60E-01	4.57E-05	1.52E-01
Carbon-14				7.32E-04	9.24E-04	5.46E-07	1.36E-05			1.29E-04	4.19E-12	1.29E-04
Cobalt-60	4.47E-07	1.95E-04		2.59E+01			1.01E-02			3.01E-01	2.23E-05	3.01E-01
Nickel-59				1.39E-01			4.47E-08			1.49E-03	2.76E-08	1.49E-03
Nickel-63				4.93E+0			1.82E-01			6.70E-02	1.21E-06	6.70E-02
Strontium-90	1.07E-04	9.93E-04		3.61E-03			7.26E-04		1.50E-11	7.99E-02	1.34E-04	7.99E-02
Technetium-99				4.43E-06			8.10E-08			1.33E-05	3.03E-10	1.33E-05
Cesium-137	1.75E-04	6.89E-04	5.52E-14	6.96E-02			6.85E-02		5.38E-09	5.33E-02	2.15E-04	5.33E-02
Uranium-234	2.38E-08			9.73E-07			5.04E-05	2.32E-06	9.97E-08	4.44E-05	1.14E-06	4.44E-05
Uranium-235	8.41E-09			1.38E-05			2.28E-06	3.98E-07	3.00E-11	2.26E-06	5.29E-08	2.26E-06
Uranium-238	1.82E-08			5.95E-04	1.85E-04	1.57E-04	2.48E-05	2.50E-05	8.47E-08	1.03E-04	3.69E-06	1.03E-04

(a) BNL = Brookhaven National Laboratory  
 GE Val = General Electric – Vallecitos  
 GJPO = Grand Junction Project Office  
 INEEL = Idaho National Engineering and Environmental Laboratory  
 ITRI = Inhalation Toxicology Research Institute  
 LLNL = Lawrence Livermore National Laboratory

ORR = Oak Ridge Reservation  
 PNTX = Pantex Facility  
 RFETS = Rocky Flats Environmental Technology Site  
 SNL = Sandia National Laboratories  
 SPRU = Separations Process Research Unit  
 WV = West Valley Nuclear Services

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2**Table F.6.** Stream 4 – TRU-RH Waste in Trenches

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Americium-241	6.35E+01	Ci/m <sup>3</sup>
Plutonium-238	1.40E+01	Ci/m <sup>3</sup>
Plutonium-239	5.51E+01	Ci/m <sup>3</sup>
Plutonium-240	3.11E+01	Ci/m <sup>3</sup>
Plutonium-241	1.20E+03	Ci/m <sup>3</sup>
Beryllium	5.00E-01	kg/m <sup>3</sup>
Sodium hydroxide	5.00E-01	kg/m <sup>3</sup>
Xylene	4.80E+00	kg/m <sup>3</sup>

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5**Table F.7.** Stream 4 – TRU-CH Waste in Trenches

<b>Constituent</b>	<b>Concentration, Ci/m<sup>3</sup></b>
Americium-241	2.63E-01
Plutonium-238	1.01E+00
Plutonium-239	5.67E-01
Plutonium-240	2.17E+01

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8**Table F.8.** Stream 5 – TRU-CH Waste in Caissons

<b>Constituent</b>	<b>Concentration, Ci/m<sup>3</sup></b>
Americium-241	5.55E+00
Cesium-137	5.06E+01
Cobalt-60	9.11E+00
Plutonium-238	8.98E-01
Plutonium-239	1.30E+01
Plutonium-240	3.26E+00
Plutonium-241	2.69E+01
Plutonium-242	1.26E-03
Strontium-90	4.67E+01
Uranium-233	1.04E-02
Uranium-234	1.30E-03
Uranium-235	3.91E-05
Uranium-238	9.57E-04

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2**Table F.9.** Stream 8 – TRU Waste Containing PCBs

Constituent	Concentration	Units
Americium-241	3.17E+00	Ci/m <sup>3</sup>
Plutonium-238	7.21E-01	Ci/m <sup>3</sup>
Plutonium-239	2.74E+00	Ci/m <sup>3</sup>
Plutonium-240	1.54E+00	Ci/m <sup>3</sup>
Plutonium-241	5.77E+01	Ci/m <sup>3</sup>
Beryllium	5.00E-01	kg/m <sup>3</sup>
Polychlorinated biphenyls (PCBs)	1.78E+00	kg/m <sup>3</sup>
Sodium hydroxide	5.00E-01	kg/m <sup>3</sup>
Xylene	4.80E+00	kg/m <sup>3</sup>

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6**Table F.10.** Stream 9 – TRU-RH and -CH Drums and SWBs  
and Stream 10 – TRU-CH Boxes

Constituent	Concentration	Units
Americium-241	3.17E+00	Ci/m <sup>3</sup>
Plutonium-238	7.21E-01	Ci/m <sup>3</sup>
Plutonium-239	2.74E+00	Ci/m <sup>3</sup>
Plutonium-240	1.54E+00	Ci/m <sup>3</sup>
Plutonium-241	5.77E+01	Ci/m <sup>3</sup>
Acetone	7.72E-04	kg/m <sup>3</sup>
Beryllium	5.00E-01	kg/m <sup>3</sup>
Carbon tetrachloride	1.33E-01	kg/m <sup>3</sup>
Dichloromethane	5.72E-03	kg/m <sup>3</sup>
Hydraulic fluid	2.31E-01	kg/m <sup>3</sup>
Mercury	4.81E-03	kg/m <sup>3</sup>
Sodium hydroxide	5.00E-01	kg/m <sup>3</sup>
1,1,1-Trichloroethane	7.86E-04	kg/m <sup>3</sup>
Xylene	4.05E-03	kg/m <sup>3</sup>

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2**Table F.11.** Stream 10 – RH-TRU Waste Boxes

Constituent	Concentration	Units
Cesium-137	7.36E+00	Ci/m <sup>3</sup>
Cobalt-60	3.13E-01	Ci/m <sup>3</sup>
Iron-55	2.79E+00	Ci/m <sup>3</sup>
Strontium-90	2.48E+00	Ci/m <sup>3</sup>
Tritium	3.93E-03	Ci/m <sup>3</sup>
Acetone	7.72E-04	kg/m <sup>3</sup>
Beryllium	5.00E-01	kg/m <sup>3</sup>
Carbon tetrachloride	1.33E-01	kg/m <sup>3</sup>
Dichloromethane	5.72E-03	kg/m <sup>3</sup>
Hydraulic fluid	2.31E-01	kg/m <sup>3</sup>
Mercury	4.81E-03	kg/m <sup>3</sup>
Sodium hydroxide	5.00E-01	kg/m <sup>3</sup>
1,1,1-Trichloroethane	7.86E-04	kg/m <sup>3</sup>
Xylene	4.05E-03	kg/m <sup>3</sup>

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5**Table F.12.** Stream 11 – MLLW-Treated Ready for Disposal

Constituent	Concentration	Units
Americium-241	3.14E-05	Ci/m <sup>3</sup>
Cesium-137	3.51E-03	Ci/m <sup>3</sup>
Cobalt-60	6.33E-01	Ci/m <sup>3</sup>
Curium-244	5.59E-04	Ci/m <sup>3</sup>
Iron-55	1.14E-01	Ci/m <sup>3</sup>
Neptunium-237	2.41E-06	Ci/m <sup>3</sup>
Nickel-63	1.17E+0	Ci/m <sup>3</sup>
Plutonium-238	2.91E-04	Ci/m <sup>3</sup>
Plutonium-239	1.23E-04	Ci/m <sup>3</sup>
Plutonium-240	2.14E-05	Ci/m <sup>3</sup>
Plutonium-241	7.44E-04	Ci/m <sup>3</sup>
Radium-224	1.68E-02	Ci/m <sup>3</sup>
Strontium-90	1.05E-02	Ci/m <sup>3</sup>
Tritium	3.93E-03	Ci/m <sup>3</sup>

**Table F.12.** (contd)

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Thorium-228	4.84E-05	Ci/m <sup>3</sup>
Thorium-232	1.45E-06	Ci/m <sup>3</sup>
Thorium-234	2.45E-02	Ci/m <sup>3</sup>
Uranium-234	2.88E-04	Ci/m <sup>3</sup>
Uranium-235	4.58E-06	Ci/m <sup>3</sup>
Uranium-236	5.38E-06	Ci/m <sup>3</sup>
Uranium-238	7.15E-05	Ci/m <sup>3</sup>
Acetone	2.05E-01	kg/m <sup>3</sup>
Beryllium	5.30E+00	kg/m <sup>3</sup>
Bromodichloromethane	1.15E-03	kg/m <sup>3</sup>
Carbon tetrachloride	4.18E-01	kg/m <sup>3</sup>
Hydraulic fluid	3.63E-01	kg/m <sup>3</sup>
Toluene	3.45E-01	kg/m <sup>3</sup>
Formic acid	9.42E-01	kg/m <sup>3</sup>
Dichloromethane	2.07E-01	kg/m <sup>3</sup>
Diesel fuel	1.59E-01	kg/m <sup>3</sup>
Methyl ethyl ketone (MEK)	1.60E-01	kg/m <sup>3</sup>
Mercury	4.93E-02	kg/m <sup>3</sup>
Nitric acid	6.70E+00	kg/m <sup>3</sup>
Polychlorinated biphenyls (PCBs)	5.75E-01	kg/m <sup>3</sup>
p-Chloroaniline	5.55E-01	kg/m <sup>3</sup>
Sodium hydroxide	9.60E+00	kg/m <sup>3</sup>
1,1,1-Trichloroethane	7.41 E-01	kg/m <sup>3</sup>
Xylene	6.21E-02	kg/m <sup>3</sup>

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2**Table F.13.** Stream 12 – MLLW-RH, and Large Boxes

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Cesium-137	7.36E+00	Ci/m <sup>3</sup>
Cobalt-60	3.13E-01	Ci/m <sup>3</sup>
Iron-55	2.79E+00	Ci/m <sup>3</sup>
Strontium-90	2.48E+00	Ci/m <sup>3</sup>
Tritium	3.93E-03	Ci/m <sup>3</sup>
Acetone	2.00E-01	kg/m <sup>3</sup>
Beryllium	5.30E+00	kg/m <sup>3</sup>
Nitric acid	6.70E+00	kg/m <sup>3</sup>
Sodium hydroxide	9.60E+00	kg/m <sup>3</sup>
Toluene	1.06E+01	kg/m <sup>3</sup>
Xylene	1.00E+00	kg/m <sup>3</sup>

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5**Table F.14.** Stream 13 –MLLW-CH

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Americium-241	3.14E-05	Ci/m <sup>3</sup>
Cesium-137	3.51E-03	Ci/m <sup>3</sup>
Cobalt-60	6.33E-01	Ci/m <sup>3</sup>
Curium-244	5.59E-04	Ci/m <sup>3</sup>
Iron-55	1.14E-01	Ci/m <sup>3</sup>
Nickel-63	1.17E+00	Ci/m <sup>3</sup>
Neptunium-237	2.41E-06	Ci/m <sup>3</sup>
Plutonium-238	2.91E-04	Ci/m <sup>3</sup>
Plutonium-239	1.23E-04	Ci/m <sup>3</sup>
Plutonium-240	2.14E-05	Ci/m <sup>3</sup>
Plutonium-241	7.44E-04	Ci/m <sup>3</sup>
Radium-224	1.68E-02	Ci/m <sup>3</sup>
Strontium-90	1.05E-02	Ci/m <sup>3</sup>
Thorium-228	4.84E-05	Ci/m <sup>3</sup>
Thorium-232	1.45E-06	Ci/m <sup>3</sup>
Thorium-234	2.45E-02	Ci/m <sup>3</sup>

**Table F.14.** (contd)

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Tritium	3.93E-03	Ci/m <sup>3</sup>
Uranium-234	2.88E-04	Ci/m <sup>3</sup>
Uranium-235	4.58E-06	Ci/m <sup>3</sup>
Uranium-236	5.38E-06	Ci/m <sup>3</sup>
Uranium-238	7.15E-05	Ci/m <sup>3</sup>
Acetone	2.05E-01	kg/m <sup>3</sup>
Beryllium	5.30E+00	kg/m <sup>3</sup>
Bromodichloromethane	1.15E-03	kg/m <sup>3</sup>
Carbon tetrachloride	4.18E-01	kg/m <sup>3</sup>
Dichloromethane	2.07E-01	kg/m <sup>3</sup>
Diesel fuel	1.59E-01	kg/m <sup>3</sup>
Formic acid	9.42E-01	kg/m <sup>3</sup>
Hydraulic fluid	3.63E-01	kg/m <sup>3</sup>
Methyl ethyl ketone (MEK)	1.60E-01	kg/m <sup>3</sup>
Mercury	4.93E-02	kg/m <sup>3</sup>
Nitrate	2.31E-01	kg/m <sup>3</sup>
Nitric acid	6.70E+0	kg/m <sup>3</sup>
Polychlorinated biphenyls (PCBs)	5.75E-01	kg/m <sup>3</sup>
p-Chloroaniline	5.55E-01	kg/m <sup>3</sup>
Sodium hydroxide	9.60E+00	kg/m <sup>3</sup>
Toluene	3.45E-01	kg/m <sup>3</sup>
1,1,1-Trichloroethane	7.41E-01	kg/m <sup>3</sup>
Xylene	6.21E-02	kg/m <sup>3</sup>

**Table F.15.** Stream 14 – Elemental Lead

Constituent	Concentration	Units
Americium-241	6.13E-05	Ci/m <sup>3</sup>
Cerium-144	3.07E-03	Ci/m <sup>3</sup>
Cesium-134	4.68E-05	Ci/m <sup>3</sup>
Cesium-137	1.26E-02	Ci/m <sup>3</sup>
Cobalt-60	1.24E-03	Ci/m <sup>3</sup>
Neptunium-237	9.53E-07	Ci/m <sup>3</sup>
Plutonium-238	9.30E-06	Ci/m <sup>3</sup>
Plutonium-239	9.48E-05	Ci/m <sup>3</sup>
Plutonium-240	4.06E-04	Ci/m <sup>3</sup>
Plutonium-241	6.44E-04	Ci/m <sup>3</sup>
Radium-224	4.17E-05	Ci/m <sup>3</sup>
Radium-226	1.92E-04	Ci/m <sup>3</sup>
Ruthenium-106	8.26E-04	Ci/m <sup>3</sup>
Strontium-90	8.64E-03	Ci/m <sup>3</sup>
Thorium-228	1.93E-03	Ci/m <sup>3</sup>
Thorium-232	1.11E-06	Ci/m <sup>3</sup>
Tritium	2.13E-05	Ci/m <sup>3</sup>
Uranium-234	6.92E-06	Ci/m <sup>3</sup>
Uranium-238	1.06E-05	Ci/m <sup>3</sup>
Lead	9.80E+02	kg/m <sup>3</sup>

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2**Table F.16.** Stream 15 – Elemental Mercury

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Americium-241	5.31E-06	Ci/m <sup>3</sup>
Cerium-144	4.62E-04	Ci/m <sup>3</sup>
Cesium-134	3.69E-06	Ci/m <sup>3</sup>
Cesium-137	8.48E-04	Ci/m <sup>3</sup>
Cobalt-60	4.60E-05	Ci/m <sup>3</sup>
Plutonium-238	5.60E-06	Ci/m <sup>3</sup>
Plutonium-239	2.70E-03	Ci/m <sup>3</sup>
Plutonium-240	1.06E-05	Ci/m <sup>3</sup>
Plutonium-241	4.06E-04	Ci/m <sup>3</sup>
Ruthenium-106	1.62E-04	Ci/m <sup>3</sup>
Strontium-90	1.18E-04	Ci/m <sup>3</sup>
Thorium-232	1.27E-05	Ci/m <sup>3</sup>
Tritium	6.98E-07	Ci/m <sup>3</sup>
Mercury	1.34E+02	kg/m <sup>3</sup>

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5**Table F.17.** Stream 17 – K Basin Sludge

<b>Constituent</b>	<b>Concentration</b>	<b>Units</b>
Americium-241	1.56E+01	Ci/m <sup>3</sup>
Cesium-134	2.08E-01	Ci/m <sup>3</sup>
Cesium-137	2.72E+02	Ci/m <sup>3</sup>
Cobalt-60	5.47E-01	Ci/m <sup>3</sup>
Neptunium-237	1.63E-03	Ci/m <sup>3</sup>
Plutonium-238	2.68E+00	Ci/m <sup>3</sup>
Plutonium-239	9.09E+00	Ci/m <sup>3</sup>
Plutonium-240	5.02E+00	Ci/m <sup>3</sup>
Strontium-90	2.73E+02	Ci/m <sup>3</sup>
Technetium-99	4.17E-01	Ci/m <sup>3</sup>
Uranium-234	3.39E-02	Ci/m <sup>3</sup>
Uranium-235	1.18E-03	Ci/m <sup>3</sup>
Uranium-236	3.97E-03	Ci/m <sup>3</sup>
Uranium-238	2.53E-02	Ci/m <sup>3</sup>
Polychlorinated biphenyls (PCBs)	1.63E-02	kg/m <sup>3</sup>

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**Table F.18.** Stream 18 – Leachate from MLLW Trenches

Constituent	Concentration, Ci/m <sup>3</sup>
Americium-241	1.44E-11
Cesium-137	3.63E-11
Cobalt-60	6.54E-09
Curium-244	2.57E-10
Iron-55	1.18E-09
Neptunium-237	1.11E-12
Nickel-63	1.21E-08
Plutonium -238	1.34E-10
Plutonium-239	5.66E-11
Plutonium-240	9.84E-12
Plutonium-241	3.42E-10
Radium-224	7.73E-09
Strontium-90	1.09E-10
Thorium-228	2.06E-11
Thorium-232	6.67E-13
Thorium-234	1.13E-08
Tritium	4.06E-11
Uranium-234	1.32E-10
Uranium-235	2.11E-12
Uranium-236	2.47E-12
Uranium-238	3.29E-11

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#### **F.1.1.1 Release Fractions for Waste Receiving and Processing Facility**

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Potential releases from the WRAP have been characterized in the Notice of Construction (NOC) reports for hazardous chemicals (DOE-RL 1993a) and radionuclides (DOE-RL 1993b). Release fractions for radionuclides are based on 40 CFR 61, Appendix D (consistent with WAC 246-247). Releases of particulate solids from the WRAP gloveboxes include a factor of 1E-03, with an additional 5E-07 reduction for double high-efficiency particulate air (HEPA) filtration efficiency. The net release fraction is then 5E-10 for particulate material and 1.0 for volatile radionuclides (such as tritium and carbon-14).

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Release fractions for non-radioactive volatile organic compounds (VOCs) were based on the vapor pressure and molecular weight of the chemical (DOE-RL 1993a, Appendix A). The releases were postulated to occur when a container was opened (within a glovebox) and the volatile chemicals were

emptied onto a holding pan with a diameter of 0.5 m (1.6 ft). The theoretical vaporization rate from this geometry was used to estimate the release rate over a one-year period. If the theoretical release rate indicated a greater release than the total inventory processed in a year, the chemical was assumed to be totally released (release fraction is 1.0).

The analysis presented in the WRAP NOC included consideration of the total mass fraction of each chemical in the annual processing inventory. A similar approach was used in the current analysis, except the mass fraction was set to 1.0, representing a case where the chemical is the only one in the container emptied onto the holding pan. Also, the WRAP NOC analysis assumed the chemical would remain on the holding pan for the entire year. In the current analysis, the time was set to one day, and the theoretical release was divided by the amount of the chemical in one drum (average value). This process is in contrast to the NOC analysis that compared the release over a year to the total amount processed in a year. The net difference in the two analyses is the current analysis is based on one drum, and the NOC analysis is based on a year of operation. The current analysis was based on one drum because the processing rates may change for each alternative and the analysis could be performed in a more straightforward manner if the processing rate were not involved in the release fraction estimation. A summary of the release fraction evaluation for the WRAP is shown in Table F.19. The release fraction for volatile chemicals indicates the dependence on physical properties. Gases represent chemicals that have a vapor pressure above one atmosphere at ambient conditions.

Release fractions for specific VOCs are presented in Table F.20. As previously discussed, the release fraction is dependent on the waste stream because the release is based on the total amount of a chemical in one drum. The release fractions are based on total glovebox throughput of the waste type in the WRAP. For example, if a waste stream of transuranic (TRU) waste is defined as going to the gloveboxes, the release fraction does not include the processing fraction (0.1) and the release fraction for most VOCs would be 1.0. If the throughput is defined as the amount going to the WRAP, the release fraction must include the processing fraction (0.1). The processing fraction is multiplied by the listed release fraction of Table F.20 to find the correct release fraction for total throughput of the WRAP.

**Table F.19.** Release Fraction Values for the WRAP

Constituents Type	Form	Release Fraction
Radioactive material	Gases	1.0
	Particulates	5E-10
Chemicals	Gases	1.0
	VOCs <sup>(a)</sup>	0.12 VM/drum amount <sup>(b)</sup>
	Inorganic chemicals	5E-10

(a) VOCs = volatile organic compounds.  
(b) Average amount in one drum expressed in kg/drum, vapor pressure (V) in atmospheres, and molecular weight (M) in g. The release fraction is limited to a maximum value of 1.0.

1           **Table F.20.** Release Fractions for Volatile Organic Compounds from the WRAP

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Chemical Name	Waste Stream Description	
	TRU Waste, New and Stored	MLLW
1,1,1-Trichloroethane	1.0	1.0
Acetone	1.0	1.0
Bromodichloromethane	1.0	1.0
Carbon tetrachloride	1.0	1.0
p-chloroaniline	1.0	2.6E-03
Dichloromethane	--	1.0
Diesel fuel	--	3.4E-02
Formic acid	1.0	1.0
Hydraulic fluid	1.1E-04	7.5E-05
Mercury	6.4E-02	6.3E-03
Methyl ethyl ketone (MEK)	1.0	1.0
Polychlorinated biphenyls (PCBs)	4.0E-05	3.0E-05
Toluene	1.0	1.0
Xylene	1.0	1.0

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4       The total estimated releases from the WRAP for each alternative are given in Tables F.21 and F.22  
5 for radionuclides and chemicals, respectively. The tables present releases for the Lower Bound and  
6 Upper Bound waste volumes for Alternative Groups A and B. The releases of radionuclides for the  
7 Hanford Only volume are just slightly smaller than those for the Lower Bound volume and are not shown.  
8 For chemicals, the releases for the Hanford Only waste volume are essentially identical to the Lower  
9 Bound volume because processing of MLLW for the two cases is nearly identical. The releases for  
10 Alternative Groups C, D, and E are essentially the same as those for Alternative Group A and are not  
11 shown.

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### 13       **F.1.1.2 Release Fractions for the Existing T Plant Complex**

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15       The release fractions are based on the value in 40 CFR 61, Appendix D (consistent with  
16 WAC 246-247), for particulate and solid contamination modified to include HEPA filtration. The  
17 2706-T facility has single HEPA filtration and 221-T has double HEPA filtration. The HEPA filtration  
18 efficiency for the 2706-T single HEPA filter is set to 99.95 percent. The analyses for releases from the  
19 existing T Plant Complex are based on all processing being done in the 2706-T facility. A summary of  
20 the release fractions for the T Plant Complex is given in Table F.23. The release fractions for specific  
21 VOCs are the same as for the WRAP (see Table F.20).

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**Table F.21.** Airborne Radionuclide Releases from the WRAP

Radionuclide	Total Release, Ci				No Action	
	Alternative Group A		Alternative Group B			
	Lower Volumes	Upper Volumes	Lower Volumes	Upper Volumes		
Americium-241	2.2E-06	2.2E-06	2.2E-06	2.2E-06	2.2E-06	
Cesium-137	1.9E-08	1.3E-07	1.9E-08	2.2E-08	1.9E-08	
Cobalt-60	1.2E-08	9.3E-08	1.2E-08	9.3E-08	1.2E-08	
Curium-244	3.5E-11	2.0E-10	3.5E-11	2.0E-10	3.5E-11	
Iron-55	7.1E-10	4.4E-09	7.1E-10	4.4E-09	7.1E-10	
Manganese-54	1.3E-13	1.3E-13	1.3E-13	1.3E-13	1.3E-13	
Nickel-63	1.1E-07	6.3E-07	1.1E-07	6.3E-07	1.1E-07	
Neptunium-237	2.6E-13	1.4E-12	2.6E-13	1.4E-12	2.6E-13	
Plutonium-238	6.9E-07	6.9E-07	6.9E-07	6.9E-07	6.9E-07	
Plutonium-239	2.9E-06	2.9E-06	2.9E-06	2.9E-06	2.9E-06	
Plutonium-240	1.7E-06	1.7E-06	1.7E-06	1.7E-06	1.7E-06	
Plutonium-241	3.3E-05	3.3E-05	3.3E-05	3.3E-05	3.3E-05	
Radium-224	2.4E-13	1.2E-12	2.4E-13	1.2E-12	2.4E-13	
Strontium-90	2.4E-08	1.7E-07	2.4E-08	2.8E-08	2.4E-08	
Thorium-234	1.0E-10	6.2E-10	1.0E-10	1.4E-10	1.0E-10	
Tritium	1.4E+02	2.7E+02	1.4E+02	2.7E+02	1.4E+02	
Uranium-234	1.2E-10	5.5E-10	1.2E-10	2.5E-10	1.2E-10	
Uranium-235	2.2E-12	1.7E-11	2.2E-12	8.3E-12	2.2E-12	
Uranium-236	8.3E-12	4.9E-11	8.3E-12	1.1E-11	8.3E-12	
Uranium-238	1.0E-10	6.2E-10	1.0E-10	1.4E-10	1.0E-10	

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The total estimated releases from the T Plant Complex for the alternative groups are shown in Tables F.24 and F.25 for radionuclides and chemicals, respectively. The releases shown for Alternative Group A are for wastes processed in existing facilities and do not include releases in the modified T Plant. The later releases are described in the next section. The tables present releases for the Lower Bound and Upper Bound waste volumes for Alternative Groups A and B. The releases of radionuclides for the Hanford Only waste volume are just slightly smaller than those for the Lower Bound volume and are not shown. For chemicals, the releases for the Hanford Only volume are essentially identical to the Lower Bound volume because processing of MLLW for the two waste volumes is nearly identical. The releases for Alternative Groups C, D, and E are essentially the same as those for Alternative Group A and are not shown.

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2**Table F.22.** Total Chemical Atmospheric Releases from the WRAP

Chemical Name	Total Release, kg				No Action	
	Alternative Group A		Alternative Group B			
	Lower Volumes	Upper Volumes	Lower Volumes	Upper Volumes		
Acetone	4.5E+01	2.3E+02	4.5E+01	2.3E+02	4.5E+01	
Beryllium	7.7E-07	3.2E-06	7.7E-07	3.2E-06	7.7E-07	
Bromodichloromethane	2.5E-01	1.3E+0	2.5E-01	1.3E+0	2.5E-01	
Carbon tetrachloride	1.9E+02	5.7E+02	1.9E+02	5.7E+02	1.9E+02	
Dichloromethane	4.9E+01	2.4E+02	4.9E+01	2.4E+02	4.9E+01	
Diesel fuel	1.2E+0	6.1E+0	1.2E+0	6.1 E+0	1.2E+0	
Formic acid	2.0E+02	1.1E+03	2.0E+02	1.1E+03	2.0E+02	
Hydraulic fluid	2.6E-02	5.0E-02	2.6E-02	4.9E-02	2.6E-02	
Mercury (elemental)	3.1E-01	5.9E-01	3.1E-01	5.7E-01	3.1E-01	
Methyl ethyl ketone (MEK)	3.4E+01	1.8E+02	3.4E+01	1.8E+02	3.4E+01	
Nitrate	2.3E-08	2.3E-08	2.3E-08	2.3E-08	2.3E-08	
Nitric acid	7.2E-07	3.8E-06	7.2E-07	3.8E-06	7.2E-07	
Polychlorinated biphenyls (PCBs)	3.8E-03	1.9E-02	3.7E-03	1.9E-02	3.7E-03	
p-chloroaniline	3.1E-01	1.6E+00	3.1E-01	1.6E+00	3.1E-01	
Sodium hydroxide	1.2E-06	5.6E-06	1.2E-06	5.6E-06	1.2E-06	
Toluene	7.4E+01	3.9E+02	7.4E+01	3.9E+02	7.4E+01	
1,1,1-Trichloroethane	1.6E+02	8.3E+02	1.6E+02	8.3E+02	1.6E+02	
Xylene	1.6E+01	7.3E+01	1.6E+01	7.3E+01	1.6E+01	

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5**Table F.23.** Release Fraction Values for the 2706-T Facility in the T Plant Complex

Operation	Form	Release Fraction	Filter Factor	Net Release Fraction
2706-T Facility	Gases	1E+00	1E+00	1E+00
	Particulates	1E-03	5E-04	5E-07
	Solids	1E-06	5E-04	5E-10

**Table F.24.** Total Radionuclide Atmospheric Release from the T Plant Complex

Radionuclide	Total Release, Ci				
	Alternative Group A		Alternative Group B		No Action
	Lower Volumes	Upper Volumes	Lower Volumes	Upper Volumes	
Americium-241	8.8E-07	8.9E-07	8.8E-07	8.9E-07	8.8E-07
Cesium-137	4.5E-04	4.6E-04	4.5E-04	4.6E-04	4.5E-04
Cobalt-60	4.2E-06	5.4E-05	4.2E-06	5.4E-05	4.2E-06
Curium-244	4.6E-08	1.0E-07	4.6E-08	1.0E-07	4.6E-08
Iron-55	2.6E-07	1.5E-06	2.6E-07	1.5E-06	2.6E-07
Manganese-54	4.1E-10	4.1E-10	4.1E-10	4.1E-10	4.1E-10
Neptunium-237	8.7E-11	4.5E-10	8.7E-11	4.5E-10	8.7E-11
Nickel-63	3.8E-05	2.7E-04	3.8E-05	2.7E-04	3.8E-05
Plutonium-238	1.3E-07	1.7E-07	1.3E-07	1.7E-07	1.3E-07
Plutonium-239	7.0E-07	7.2E-07	7.0E-07	7.2E-07	7.0E-07
Plutonium-240	2.7E-07	2.8E-07	2.7E-07	2.8E-07	2.7E-07
Plutonium-241	6.5E-06	6.6E-06	6.5E-06	6.6E-06	6.5E-06
Strontium-90	5.7E-04	5.7E-04	5.7E-04	5.7E-04	5.7E-04
Thorium-228	8.1E-11	4.1E-10	8.1E-11	4.1E-10	8.1E-11
Thorium-232	5.2E-11	2.7E-10	5.2E-11	2.7E-10	5.2E-11
Thorium-234	2.2E-06	2.2E-06	2.2E-06	2.2E-06	2.2E-06
Tritium	6.4E+02	1.1E+03	6.4E+02	1.1E+03	6.4E+02
Uranium-234	1.4E-06	1.4E-06	1.4E-06	1.4E-06	1.4E-06
Uranium-235	4.0E-08	4.1E-08	4.0E-08	4.1E-08	4.0E-08
Uranium-236	1.8E-07	1.8E-07	1.8E-07	1.8E-07	1.8E-07
Uranium-238	2.2E-06	2.2E-06	2.2E-06	2.2E-06	2.2E-06

1      **Table F.25.** Total Chemical Atmospheric Releases from the T Plant Complex  
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Chemical Name	Total Release, kg				
	Alternative Group A		Alternative Group B		No Action
	Lower Bound Volumes	Upper Bound Volumes	Lower Bound Volumes	Upper Bound Volumes	
Acetone	1.5E+01	7.7E+01	1.5E+01	7.6E+01	1.5E+01
Beryllium	1.9E-04	9.9E-04	1.9E-04	9.8E-04	1.3E-05
Bromodichloromethane	8.3E-02	4.3E-01	8.3E-02	4.3E-01	8.3E-02
Carbon tetrachloride	3.0E+01	1.6E+02	3.0E+01	1.6E+02	3.0E+01
Dichloromethane	1.5E+01	7.8E+01	1.5E+01	7.7E+01	1.5E+01
Diesel fuel	3.9E-01	2.0E+00	3.9E-01	2.0E+00	3.9E-01
Formic acid	6.8E+01	3.5E+02	6.8E+01	3.5E+02	6.8E+01
Hydraulic fluid	2.0E-03	1.0E-02	2.0E-03	1.0E-02	2.0E-03
Mercury (elemental)	2.2E-02	1.2E-01	2.2E-02	1.2E-01	2.2E-02
Methyl ethyl ketone (MEK)	1.2E+01	6.0E+01	1.2E+01	5.9E+01	1.2E+01
Nitrate	7.8E-06	7.8E-06	7.8E-06	7.8E-06	7.8E-06
Nitric acid	2.4E-04	1.3E-03	2.4E-04	1.2E-03	1.6E-05
Polychlorinated biphenyls (PCBs)	1.2E-03	6.5E-03	1.2E-03	6.4E-03	1.2E-03
p-chloroaniline	1.0E-01	5.4E-01	1.0E-01	5.3E-01	1.0E-01
Sodium hydroxide	3.5E-04	1.8E-03	3.5E-04	1.8E-03	2.3E-05
Toluene	2.5E+01	1.3E+02	2.5E+01	1.3E+02	2.5E+01
1,1,1-Trichloroethane	5.3E+01	2.8E+02	5.3E+01	2.7E+02	5.3E+01
Xylene	4.5E+00	2.3E+01	4.5E+00	2.3E+01	4.5E+00

(a) PCBs = polychlorinated biphenyls.

3      **F.1.1.3 The New Waste Processing Facility and Modified T Plant Complex**  
45      The handling of wastes in the new waste processing facility and the modified T Plant Complex would  
6      be conducted in a manner similar to that in the WRAP except that some operations would be performed  
7      remotely. Therefore, the release fractions applicable to the WRAP were also used to estimate releases  
8      from waste processed in the new waste processing facility and the modified T Plant Complex. Double  
9      HEPA filtration was assumed for these facilities. Because some mixed waste may be processed in these  
10     facilities, the release fractions for hazardous chemicals are also needed. The release fractions are  
11     summarized in Table F.26. The release fractions for specific VOCs are the same as those presented for  
12     the WRAP (see Table F.20).  
13

1           **Table F.26.** Release Fraction Values for the New Waste Processing Facility and the  
 2           Modified T Plant Complex  
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<b>Constituent Type</b>	<b>Form</b>	<b>Release Fraction</b>
Radioactive material	Gases	1E+0
	Particulates	5E-10
Chemicals	Gases	1E+00
	VOCs <sup>(a)</sup>	0.12VM/drum amount <sup>(b)</sup>
	Inorganic chemicals	5E-10

(a) VOCs = volatile organic compounds.  
 (b) Average amount in one drum expressed in kg/drum, vapor pressure (V) is in atmospheres and molecular weight (M) is in g. The release fraction is limited to a maximum value of 1.0.

4           The total estimated releases from the modified T Plant Complex for Alternative Group A are given in  
 5           Tables F.27 and F.28 for radionuclides and chemicals, respectively. Total releases of radionuclides for  
 6           the new waste processing facility for Alternative Group B are shown in Table F.29. Chemical releases for  
 7           the new waste processing facility for Alternative Group B are shown in Table F.30. Releases are  
 8           estimated to be the same for the Lower and Upper Bound waste volume estimates because waste streams  
 9           processing in these facilities are the same for both options. The releases for Alternative Groups C, D, and  
 10          E are essentially the same as those for Alternative Group A and are not shown.

12           **Table F.27.** Total Radionuclide Atmospheric Release from the Modified T Plant Complex for  
 13           Alternative Group A (both Lower Bound and Upper Bound Waste Volumes)  
 14  
 15

<b>Radionuclide</b>	<b>Total Release, Ci</b>
Americium-241	3.1E-04
Cesium-134	4.2E-11
Cesium-137	2.3E-05
Cobalt-60	3.8E-08
Iron-55	1.3E-08
Plutonium-238	4.0E-05
Plutonium-239	1.9E-04
Plutonium-240	1.1E-04
Plutonium-241	1.2E-03
Strontium-90	1.6E-05
Technetium-99	2.9E-08
Tritium	4.4E+02
Uranium-234	5.7E-09
Uranium-235	8.3E-11
Uranium-236	2.8E-10
Uranium-238	1.8E-09

1                   **Table F.28.** Total Chemical Atmospheric Releases from the Modified  
 2                   T Plant Complex for Alternative Group A  
 3

Chemical Name	Total Release, kg
Acetone	5.8E+02
Beryllium	1.0E-05
Carbon tetrachloride	4.3E+02
Dichloromethane	1.9E+01
Hydraulic fluid	8.3E-02
Mercury (elemental)	1.0E+00
Nitric acid	9.7E-06
Polychlorinated biphenyls (PCBs)	6.8E-03
Sodium hydroxide	1.6E-05
Toluene	3.1E+04
1,1,1-Trichloroethane	2.6E+00
Xylene	3.7E+04

4  
 5                   **Table F.29.** Atmospheric Radionuclide Releases from the New  
 6                   Waste Processing Facility for Alternative Group B  
 7

Radionuclide	Total Release, Ci
Americium-241	2.3E-04
Cerium-144	5.9E-15
Cesium-134	7.9E-12
Cesium-137	1.8E-05
Cobalt-60	1.0E-06
Curium-244	4.8E-09
Iron-55	2.9E-08
Neptunium-237	1.6E-10
Plutonium-238	2.9E-05
Plutonium-239	1.4E-04
Plutonium-240	8.1E-05
Plutonium-241	7.7E-04
Strontium-90	1.4E-05
Technetium-99	2.9E-08
Thorium-234	3.1E-09
Tritium	5.1E+01
Uranium-234	1.0E-08
Uranium-235	1.7E-10
Uranium-236	3.7E-10
Uranium-238	3.1E-09

1  
2  
3

**Table F.30.** Total Chemical Atmospheric Releases from the New  
Waste Processing Facility for Alternative Group B

Chemical Name	Total Release, kg
Acetone	7.9E+03
Beryllium	1.0E-04
Bromodichloromethane	4.2E+01
Carbon tetrachloride	4.3E+02
Dichloromethane	7.5E+03
Diesel Fuel	2.0E+02
Formic Acid	3.4E+04
Hydraulic fluid	1.0E+03
Lead	4.8E-04
Mercury (elemental)	4.2E+01
Methyl ethyl ketone (MEK)	5.8E+03
Nitrate	4.2E-06
Nitric acid	1.3E-04
Polychlorinated biphenyls (PCBs)	6.3E-01
p-chloroaniline	5.2E+01
Sodium hydroxide	1.8E-04
Toluene	3.4E+04
1,1,1-Trichloroethane	2.7E+04
Xylene	4.6E+03

4

#### 5      **F.1.1.4 Pulse Drier Operation**

6

7      The treatment of trench leachate would be performed in the Effluent Treatment Facility until that  
8 facility is decommissioned in 2025. Starting in 2026, the plan is to treat leachate using pulse driers  
9 installed near the trenches. Releases from drier operations are estimated using a release fraction of 0.001  
10 (40 CFR 61, Appendix D) and a HEPA filtration factor of 5E-04. The net release fraction of 5E-07 is  
11 applied to radionuclides in the leachate from the trenches except for tritium and carbon-14, which are  
12 assumed to be totally released. The leachate is not expected to contain substantial amounts of volatile  
13 hazardous chemicals. The total annual release from leachate treatment using pulse driers is given in  
14 Table F.31 for Alternative Groups A and B. Releases for Alternative Groups C and D and for the No  
15 Action Alternative are given in Table F.32. Releases for Alternative Group E are expected to be the same  
16 as those for Alternative Group D.

1      **Table F.31.** Atmospheric Radionuclide Release from Pulse Drier Leachate Treatment: Alternative  
 2      Groups A and B  
 3

Radionuclide	Total Release, Ci					
	Alternative Group A			Alternative Group B		
	Hanford Only	Lower Volumes	Upper Volumes	Hanford Only	Lower Volumes	Upper Volumes
Americium-241	4.6E-13	1.1E-12	1.5E-12	3.4E-12	4.0E-12	6.7E-12
Cesium-137	3.0E-13	6.8E-13	9.9E-13	2.2E-12	2.6E-12	4.3E-12
Cobalt-60	9.8E-13	2.3E-12	3.3E-12	7.3E-12	8.5E-12	1.4E-11
Curium-244	1.2E-12	2.7E-12	3.9E-12	8.7E-12	1.0E-11	1.7E-11
Iron-55	2.5E-15	5.7E-15	8.2E-15	1.8E-14	2.1E-14	3.6E-14
Neptunium-237	2.2E-14	5.1E-14	7.5E-14	1.7E-13	1.9E-13	3.3E-13
Nickel-63	1.8E-10	4.2E-10	6.1E-10	1.4E-09	1.6E-09	2.7E-09
Plutonium-238	2.0E-12	4.5E-12	6.6E-12	1.5E-11	1.7E-11	2.9E-11
Plutonium-239	1.1E-12	2.6E-12	3.8E-12	8.5E-12	9.9E-12	1.7E-11
Plutonium-240	2.1E-13	4.8E-13	7.0E-13	1.6E-12	1.8E-12	3.0E-12
Plutonium-241	1.1E-12	2.5E-12	3.6E-12	7.9E-12	9.3E-12	1.6E-11
Strontium-90	8.6E-13	2.0E-12	2.9E-12	6.4E-12	7.5E-12	1.3E-11
Tritium	1.9E-07	4.3E-07	6.3E-07	1.4E-06	1.6E-06	2.7E-06
Uranium-234	2.7E-12	6.1E-12	8.9E-12	2.0E-11	2.3E-11	3.9E-11
Uranium-235	4.2E-14	9.8E-14	1.4E-13	3.2E-13	3.7E-13	6.2E-13
Uranium-236	5.0E-14	1.1E-13	1.7E-13	3.7E-13	4.3E-13	7.2E-13
Uranium-238	6.6E-13	1.5E-12	2.2E-12	4.9E-12	5.8E-12	9.6E-12

1      **Table F.32.** Atmospheric Radionuclide Release from Pulse Drier Leachate Treatment: Alternative  
 2      Groups C and D, and the No Action Alternative  
 3

Radionuclide	Total Release, Ci						No Action	
	Alternative Group C			Alternative Group D				
	Hanford Only	Lower Volumes	Upper Volumes	Hanford Only	Lower Volumes	Upper Volumes		
Americium-241	4.6E-13	4.8E-13	9.6E-13	1.2E-12	1.3E-12	3.0E-12	1.5E-13	
Cesium-137	3.0E-13	3.1E-13	6.2E-13	7.6E-13	8.4E-13	1.9E-12	1.2E-13	
Cobalt-60	9.8E-13	1.0E-12	2.1E-12	2.5E-12	2.8E-12	6.3E-12	5.8E-13	
Curium-244	1.2E-12	1.2E-12	2.4E-12	3.0E-12	3.3E-12	7.5E-12	4.9E-13	
Iron-55	2.5E-15	2.6E-15	5.1E-15	6.3E-15	7.0E-15	1.6E-14	1.8E-15	
Neptunium-237	2.2E-14	2.3E-14	4.7E-14	5.7E-14	6.4E-14	1.4E-13	7.6E-15	
Nickel-63	1.8E-10	1.9E-10	3.8E-10	4.7E-10	5.2E-10	1.2E-09	6.5E-11	
Plutonium -238	2.0E-12	2.1E-12	4.1E-12	5.1E-12	5.6E-12	1.3E-11	7.0E-13	
Plutonium-239	1.1E-12	1.2E-12	2.4E-12	2.9E-12	3.3E-12	7.3E-12	3.9E-13	
Plutonium-240	2.1E-13	2.2E-13	4.3E-13	5.3E-13	5.9E-13	1.3E-12	7.0E-14	
Plutonium-241	1.1E-12	1.1E-12	2.2E-12	2.7E-12	3.1E-12	6.9E-12	4.7E-13	
Strontium-90	8.6E-13	9.0E-13	1.8E-12	2.2E-12	2.5E-12	5.6E-12	3.3E-13	
Tritium	1.9E-07	2.0E-07	3.9E-07	4.8E-07	5.4E-07	1.2E-06	8.5E-08	
Uranium-234	2.7E-12	2.8E-12	5.6E-12	6.8E-12	7.6E-12	1.7E-11	9.0E-13	
Uranium-235	4.2E-14	4.4E-14	8.9E-14	1.1E-13	1.2E-13	2.7E-13	1.4E-14	
Uranium-236	5.0E-14	5.2E-14	1.0E-13	1.3E-13	1.4E-13	3.2E-13	1.7E-14	
Uranium-238	6.6E-13	6.9E-13	1.4E-12	1.7E-12	1.9E-12	4.3E-12	2.2E-13	

## F.1.2 Release Point Characteristics

The atmospheric transport analysis requires definition of release point characteristics for each facility that has a release to air. The characteristics are presented in Table F.33 for the WRAP, 2706-T facility, the modified T Plant Complex, and pulse driers. Values for the WRAP are taken from the NOC (DOE-RL 2001); for the 2706-T facility from the Interim Safety Analysis for T Plant (Meyer 1998); for the modified T Plant Complex from the NOC (DOE-RL 2000) and Rokkan et al. (2001). Pulse drier characteristics are from the Technical Information Document (FH 2003). For all facilities, the temperature of outside air is set to the annual average value of 12°C (53.6°F).

1  
2**Table F.33.** Release Point Characteristics

Parameter	Units	WRAP and New Waste Processing Facility	2706-T Facility	Modified T Plant Complex	Pulse Driers
Stack height	M	14	8.5	61	5
Exit area	m <sup>2</sup>	0.5	0.39	1.8	0.20
Exit velocity	m/s	15.4	15 <sup>(a)</sup>	8.3	1.5
Exit air temperature	°C	32.2	25.6	23.9	74
Height of building	M	7	7.62	25	4.3

(a) The average exit velocity was set to one half the maximum value for the 2706-T facility.

3

#### 4      **F.1.3 Atmospheric Transport**

5

6      The transport and deposition of material released to the atmosphere was evaluated using the  
 7      atmospheric transport component of MEPAS Version 4.0. This component implements the models from  
 8      earlier versions of MEPAS, as described by Droppo and Buck (1996). The models are similar to and  
 9      consistent with the models recommended by EPA in the Industrial Source Complex dispersion model  
 10     (EPA 1995). Also, the atmospheric dispersion models in the MEPAS program provide nearly identical  
 11     results to those generated using the EPA CAP88 program, as verified in a benchmarking study performed  
 12     on the MEPAS, MMSOILS, and RESRAD computer programs (Mills et al. 1997). The RESRAD  
 13     program uses the CAP88 program for atmospheric transport calculations (Cheng et al. 1995).

14

15     The MEPAS model uses a data set of the annual joint frequency of occurrence of wind speed, wind  
 16     direction, and atmospheric stability from the 200 Area Hanford Meteorology Station. The data set used  
 17     for the present analysis was the 14-year average for the years 1983 through 1996 (Hoitink and Burk 1997)  
 18     as presented in Tables F.34 and F.35. This data set is used in the atmospheric transport and deposition  
 19     model to evaluate the air concentration and deposition rate as a function of direction and downwind  
 20     distance. The pollutant concentrations in air and deposition rates are expressed as annual average values.  
 21     The annual joint frequency data set is based on heights of 9.1 m (30 ft) and 60 m (197 ft) for Tables F.34  
 22     and F.35, respectively. The MEPAS code adjusts the data to represent the actual release height defined in  
 23     Table F.33.

24

25     The population dose values were estimated from the calculated individual doses by multiplying by a  
 26     conversion factor relating the population weighted  $\chi/Q$  value to the  $\chi/Q$  value at the location of the offsite  
 27     MEI ( $7E+04$  person-s/m<sup>3</sup>). This conversion factor was also used to estimate population health impacts  
 28     from carcinogenic chemicals. The population distribution (Beck et al. 1991) is given in Table F.36.

29

**Table F.34.** Joint Frequency Distributions for the 200 Areas at 9.1-m (30-ft) Towers, 1983-1996 Historical Data

**Table F.35.** Joint Frequency Distributions for the 200 Areas at 60-m (197-ft) Aboveground Level, 1983-1996 Historical Data

Average Wind Speed m/s	Atmospheric Stability Class	Percentage of Time Wind Blows from the 200 Area Toward the Direction Indicated															
		S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
0.89	A	0.11	0.13	0.15	0.11	0.11	0.12	0.07	0.05	0.03	0.02	0.04	0.03	0.05	0.03	0.05	0.07
	B	0.09	0.09	0.08	0.07	0.07	0.06	0.06	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.05	0.07
	C	0.09	0.08	0.1	0.08	0.07	0.06	0.06	0.04	0.02	0.02	0.02	0.02	0.03	0.04	0.04	0.08
	D	0.58	0.53	0.51	0.43	0.45	0.49	0.52	0.35	0.24	0.22	0.22	0.2	0.27	0.35	0.44	0.54
	E	0.29	0.22	0.2	0.18	0.22	0.28	0.32	0.25	0.18	0.17	0.17	0.17	0.23	0.25	0.31	0.32
	F	0.2	0.13	0.12	0.11	0.14	0.14	0.19	0.14	0.13	0.12	0.13	0.12	0.17	0.19	0.23	0.21
	G	0.07	0.05	0.05	0.05	0.06	0.07	0.1	0.07	0.07	0.06	0.08	0.09	0.09	0.11	0.12	0.1
2.65	A	0.61	0.5	0.46	0.41	0.43	0.41	0.43	0.3	0.2	0.18	0.18	0.17	0.12	0.16	0.43	0.58
	B	0.25	0.2	0.16	0.12	0.14	0.13	0.12	0.1	0.07	0.06	0.07	0.05	0.06	0.09	0.22	0.27
	C	0.23	0.16	0.13	0.09	0.1	0.1	0.12	0.07	0.05	0.06	0.06	0.05	0.04	0.08	0.21	0.28
	D	0.79	0.56	0.39	0.32	0.39	0.37	0.5	0.34	0.22	0.23	0.24	0.25	0.35	0.63	1.29	1.1
	E	0.37	0.23	0.18	0.16	0.22	0.23	0.34	0.34	0.18	0.18	0.25	0.34	0.5	0.8	0.95	0.66
	F	0.28	0.13	0.11	0.08	0.1	0.12	0.22	0.23	0.18	0.17	0.23	0.3	0.53	0.79	0.81	0.6
	G	0.09	0.05	0.04	0.03	0.04	0.03	0.08	0.11	0.1	0.1	0.13	0.19	0.33	0.41	0.32	0.23
4.7	A	0.32	0.29	0.18	0.08	0.08	0.06	0.09	0.09	0.09	0.15	0.28	0.27	0.14	0.19	0.64	0.41
	B	0.09	0.08	0.04	0.03	0.03	0.02	0.02	0.03	0.03	0.04	0.08	0.09	0.05	0.09	0.28	0.15
	C	0.06	0.05	0.03	0.02	0.02	0.01	0.02	0.02	0.02	0.04	0.05	0.07	0.05	0.07	0.21	0.13
	D	0.2	0.16	0.09	0.06	0.08	0.08	0.13	0.14	0.12	0.16	0.26	0.31	0.31	0.83	1.55	0.48
	E	0.21	0.1	0.09	0.06	0.09	0.08	0.15	0.21	0.13	0.15	0.27	0.54	0.95	1.72	1.52	0.45
	F	0.14	0.06	0.04	0.02	0.04	0.03	0.09	0.2	0.08	0.06	0.15	0.35	0.78	1.34	1.41	0.49
	G	0.04	0.01	0	0	0	0	0.03	0.05	0.03	0.03	0.06	0.15	0.33	0.47	0.64	0.27

F.29

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**Table F.35.** (contd)

**Table F.35.** (contd)

Average Wind Speed m/s	Atmospheric Stability Class	Percentage of Time Wind Blows from the 200 Area Toward the Direction Indicated																
		S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	
15.6	A	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0	0	0.02	0	
	B	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0.01	0	
	C	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0.01	0	
	D	0	0	0	0	0	0	0	0	0	0.04	0.08	0.03	0.01	0.03	0.06	0	
	E	0	0	0	0	0	0	0	0	0	0.03	0.04	0.01	0.01	0.03	0.05	0	
	F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
19	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	D	0	0	0	0	0	0	0	0	0	0.01	0.03	0.01	0	0	0	0	
	E	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0	0	0	
	F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1  
2**Table F.36.** Population Within 80 km (50 mi) of the 200 Areas

Downwind Sector	Distance Interval, mi					
	0-10	10-20	20-30	30-40	40-50	Total
S	0	959	790	175	4281	6205
SSW	0	180	12,966	293	298	13,737
SW	0	33	30,654	3205	95	33,987
WSW	1	53	2309	23,398	7055	32,816
W	7	37	188	10,558	118,630	129,420
WNW	0	1365	33	10	6178	7586
NW	11	3358	933	92	2336	6730
NNW	4	320	751	1713	7123	9911
N	0	170	2980	438	3018	6606
NNE	0	29	1085	4150	27,277	32,541
NE	0	115	10821	3651	670	15,257
ENE	0	347	1184	1705	220	3456
E	0	548	2387	1953	325	5213
ESE	0	305	1851	514	1301	3971
SE	0	213	51,919	96,942	1250	150,324
SSE	0	2316	17,659	905	7655	28,535
Total	23	10,348	138,510	149,702	187,712	486,295

3

#### 4      **F.1.4 Exposure Scenarios**

5

6      Two exposure scenarios have been used to evaluate the potential impacts to humans from the waste  
 7 remediation activities: industrial and resident gardener (agricultural). For waterborne pathways, an  
 8 additional analysis has been performed for the resident gardener scenario to include a sauna/sweat lodge  
 9 exposure pathway (indicated in the result tables of this appendix as the hypothetical resident gardener  
 10 with sauna/sweat lodge). These scenarios were chosen to represent a range of habits and conditions for  
 11 potential exposures. The industrial and resident gardener scenarios are based on the recommendations  
 12 presented in the Hanford Site Risk Assessment Methodology (HSRAM) (DOE-RL 1995) as adopted by  
 13 the TPA. These scenarios are based on the concept of reasonable maximum exposure as recommended  
 14 by EPA (Means 1989) for which the most conservative parameter is not always used. The resident  
 15 gardener with a sauna/sweat lodge scenario also includes exposure to waterborne contamination used in a  
 16 sweat lodge (Harris and Harper 1997; DOE-RL 1998) or sauna. The resident gardener with a sauna/sweat  
 17 lodge scenario is only applied to waterborne pathways because the airborne pathways do not contribute to  
 18 the sauna/sweat lodge exposure pathways.

1       The present analysis has used the HSRAM scenarios and exposure parameter values as published  
2 (DOE-RL 1995). These scenarios and parameters provide a conservative estimate of potential exposures  
3 of individuals living on or near the Hanford Site. When the annual radiation dose is evaluated, the  
4 HSRAM scenarios are modified to reflect exposure for a one-year period instead of an extended exposure  
5 duration. The lifetime impacts can be estimated by multiplication of the annual values by the exposure  
6 duration for the scenario (20 years for the industrial scenario and 30 years for the resident gardener  
7 scenario).

8  
9       Exposure assessments are performed for atmospheric releases (from normal operations) and for long-  
10 term transport via groundwater. For normal operations, the exposure assessment uses the results from the  
11 atmospheric transport analysis as the starting point for evaluation of pollutant concentrations in exposure  
12 media (for example, air, soil, and foods). The analysis begins with the first release from a facility and  
13 continues until the releases have stopped and the individuals have been exposed for the prescribed  
14 duration for the specific exposure scenario. The operating and waste-handling periods for the facility  
15 being considered determine the release period. During the release period, the transported material may be  
16 deposited into soil resulting in a gradual increase over time in concentrations of pollutants in soil. The  
17 accumulation in soil is evaluated explicitly by the MEPAS program and is used to determine the annual  
18 maximum radiation dose and the exposures for each of the exposure scenarios.

19  
20      For long-term transport via groundwater, the exposure assessment uses the estimated water  
21 concentration at the point of exposure (for example, a point of analysis 1 km from the 200 East Area, a  
22 point of analysis 1 km from the 200 West Area, a point of analysis 1 km from the ERDF site, and another  
23 point of analysis near the Columbia River). This water is used as the source of domestic water, for  
24 irrigation of food crops, animal product feed, and animal drinking water (for the resident gardener  
25 scenario).

26  
27      Two exposure scenarios are summarized in the following sections. The scenarios are described for  
28 exposure pathways involving atmospheric releases, as well as releases resulting in groundwater  
29 contamination. The atmospheric pathways are evaluated to estimate health impacts for releases to air  
30 from normal operations; waterborne pathways are evaluated to estimate health impacts from releases to  
31 soil and transport via groundwater to the environment. A discussion of each exposure pathway follows  
32 the scenario descriptions.

33  
34      **F.1.4.1 Industrial Scenario**

35  
36      The industrial scenario is intended to represent potential exposures to workers in a commercial or  
37 industrial setting. The scenario primarily involves indoor activities, but outdoor activities (such as soil  
38 contact) are also included. The workers are assumed to wear no protective clothing. The scenario is not  
39 intended to represent exposure of remediation workers. For atmospheric releases, the worker is assumed  
40 to be located 100 m (328 ft) east of the release point. The specific exposure pathways included in the  
41 industrial scenario are listed in Table F.37 for radionuclides, chemicals, and the atmospheric transport  
42 medium. Parameter values for the pathways are presented in Table F.38.

1  
2**Table F.37.** Industrial Scenario Exposure Pathways

Transport Medium	Exposure Pathway	Chemical	Radionuclide
Air (with deposition to soil)	Ingestion	Yes	Yes
	External	No	Yes
	Dermal absorption	Yes	No
	Soil suspension – inhalation	Yes	Yes
	Air inhalation	Yes	Yes

3  
4  
5**Table F.38.** Industrial Scenario Parameter Values

Exposure Parameters <sup>(a)</sup>					
Source	Exposure Pathway	Intake Rate	Exposure Frequency, d/yr	Conversion Factors	Other Factors
Air (with deposition to soil)	Soil ingestion	50 mg/d	146	1E-06 kg/mg	--
	Soil external	8 hr/d	146	--	0.8 <sup>(b)</sup>
	Soil dermal absorption	0.2 mg/cm <sup>2</sup> /d	146	1E-06 kg/mg	5000 cm <sup>2</sup> <sup>(c)</sup>
	Soil suspension – inhalation	20 m <sup>3</sup> /d	250	1E-09 kg/µg	50 µg/m <sup>3</sup> <sup>(d)</sup>
	Air inhalation	20 m <sup>3</sup> /d	250	--	--

(a) For all cases, the body weight is 70 kg (155 lb). The exposure period is 1 year for annual dose estimates and 20 years for other analyses.  
(b) Average shielding factor for external exposure to contaminated soil.  
(c) Skin surface area contacted with soil by the worker.  
(d) Average particulate loading in air.

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#### F.1.4.2 Resident Gardener Scenario

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The resident gardener scenario is intended to represent potential exposures to an individual living near the Hanford Site and raising food and animal products for home consumption. The agriculture scenario from the HSRAM is applied to atmospheric and groundwater transport pathways. This scenario is the same as the agricultural scenario representing the point of maximum offsite air concentration for routine releases. The specific exposure pathways for radionuclides and chemicals that are included in the resident gardener scenario are listed in Table F.39. Parameter values for each exposure pathway are presented in Table F.40.

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Several different exposure pathways are considered in the health impacts analyses. The pathways included in a specific analysis depend on the transport medium, scenario, and pollutant type (that is, chemical or radionuclide), as indicated in the previous section. Details of each exposure pathway are presented here by transport medium. In general, the parameter values for a pathway are taken from the HSRAM report (DOE-RL 1995) and from Harris and Harper (1997) and DOE-RL (1998) for the sauna/sweat lodge pathway.

**Table F.39.** Resident Gardener Scenario Exposure Pathways

<b>Transport Medium</b>	<b>Exposure Pathway</b>	<b>Chemical</b>	<b>Radionuclide</b>
Soil (air deposition)	Ingestion	Yes	Yes
	External	No	Yes
	Dermal absorption	Yes	No
	Biota – dairy	Yes	Yes
	Biota – meat	Yes	Yes
	Biota – game (deer)	Yes	Yes
	Biota – fruit	Yes	Yes
	Biota – vegetables	Yes	Yes
	Suspension – inhalation	Yes	Yes
Air	Inhalation	Yes	Yes
	Biota – dairy	Yes	Yes
	Biota – meat	Yes	Yes
	Biota – game (deer)	Yes	Yes
	Biota – fruit	Yes	Yes
	Biota – vegetables	Yes	Yes
Groundwater	Ingestion	Yes	Yes
	Dermal absorption (bathing)	Yes	No
	Biota – dairy	Yes	Yes
	Biota – meat	Yes	Yes
	Biota – game (deer)	Yes	Yes
	Biota – fruit	Yes	Yes
	Biota – vegetables	Yes	Yes
	Inhalation indoor	Yes	Yes

**Table F.40.** Resident Gardener Scenario Exposure Factors

Exposure Parameters <sup>(a)</sup>					
Source	Exposure Pathway	Intake Rate	Exposure Frequency, d/yr	Conversion Factors	Other Factors
Soil	Ingestion	100 mg/d	365	1E-06 kg/mg	--
	External	24 hr/d	365	--	0.8 <sup>(b)</sup>
	Dermal absorption	0.2 mg/cm <sup>2</sup> /d	180	1E-06 kg/mg	5000 cm <sup>2</sup> <sup>(c)</sup>
	Inhalation	20 m <sup>3</sup> /d	365	1E-09 kg/µg	50 µg/m <sup>3</sup> <sup>(d)</sup>
Air	Inhalation	20 m <sup>3</sup> /d	365	--	--
Groundwater	Ingestion	2 L/d	365	--	--
	Inhalation (sauna or sweat lodge)	20 m <sup>3</sup> /d	365	--	1.9 L/m <sup>3</sup> <sup>(e)</sup> VOC 0.3 L/m <sup>3</sup> <sup>(g)</sup> non-volatile 1 hr/d <sup>(f)</sup> 4 L/d
	Dermal absorption	0.17 hr/d	365	1E-03 L/cm <sup>3</sup>	20,000 cm <sup>2</sup> <sup>(g)</sup>
Biota	Dairy	300 g/d	365	1E-03 kg/g	--
	Meat	75 g/d	365	1E-03 kg/g	--
	Game	15 g/d	365	1E-03 kg/g	--
	Fruit	42 g/d	365	1E-03 kg/g	--
	Vegetable	80 g/d	365	1E-03 kg/g	--
(a) For all cases the body weight is 70 kg (155 lb). The exposure period is for 1-year annual dose estimates and 30 years for other analyses. (b) Average shielding factor for external exposure to contaminated soil. (c) Skin surface area contacted with soil by the worker. (d) Average particulate loading in air. (e) The sauna or sweat lodge transfer factor (1.9 L/m <sup>3</sup> ) for VOCs assumes 4 L/d water use in a hemisphere of a 2-m (6.6-ft) diameter with complete suspension of all contaminants. (f) Ratio of indoor air concentration to water concentration for volatilization from indoor water uses. (g) Skin surface area contacted during bathing with domestic water.					

1       **F.1.4.3 Soil (Air or Irrigation Water Deposition) Transport Medium**

2

3       Deposition of airborne activity on soil would result in exposure to individuals who come in contact  
4       with the soil, breathe resuspended particles from the soil, or eat foods grown in the soil. The contamination  
5       deposited onto soil is modeled as a pollutant concentration per unit area of soil. Some of the soil  
6       exposure pathways require concentration to be expressed in units of soil mass (mg/kg or pCi/kg dry soil).  
7       For these pathways, the conversion to soil mass is made using the conversion factor 60 kg/m<sup>2</sup> that is  
8       based on uniform distribution of the contaminant in the top 4 cm (1.6 in.) of soil having a density of  
9       1.5 g/cm<sup>3</sup>. This thickness is representative of the distribution of contaminants in residential soil (such as  
10      lawns) for deposition occurring over extended periods (for instance, several years). For agricultural  
11      pathways, the conversion is based on uniform distribution in 15 cm (6 in.) of soil (plow layer) with a  
12      conversion factor of 225 kg/m<sup>2</sup>.

13

14      The parameter values for each exposure pathway related to soil as a medium have been presented in  
15      the preceding tables for the three exposure scenarios. Notes on the exposure pathways follow.

16

17      **Soil Ingestion.** The individual is assumed to inadvertently ingest contaminated soil as part of daily  
18      activities defined for the scenarios. The resident gardener ingests soil at 100 mg/day for the entire year,  
19      while the industrial worker ingests 50 mg/day while on the job for 146 days per year. It is assumed the  
20      worker is exposed to soil for only 146 of the 250 workdays per year.

21

22      **Soil External Exposure.** Radionuclides deposited onto soil may cause external radiation exposure to  
23      individuals near the contamination. The industrial worker is assumed to be exposed 8 hours per day for  
24      146 days per year. The resident gardener is exposed 24 hours per day for 365 days per year.

25

26      **Soil Dermal Contact.** The dermal contact pathway is evaluated only for chemicals (as recommended  
27      in DOE-RL 1995). The individuals are assumed to have one contact event per day (a 12-hour period)  
28      with soil adhering to the skin at a surface density of 0.2 mg/cm<sup>2</sup> of skin for the industrial and resident  
29      gardener scenarios. The area of skin contacted is assumed to be 5000 cm<sup>2</sup> for all scenarios. The  
30      industrial worker is exposed 146 days per year; the resident gardener is exposed 180 days per year.

31

32      **Soil Resuspension Inhalation.** Material deposited on the ground is assumed to be available for  
33      resuspension and inhalation by individuals in proximity to the contamination. The industrial worker and  
34      resident gardener scenarios assume the individual inhales 20 m<sup>3</sup> (706 ft<sup>3</sup>) of contaminated air per day.  
35      The airborne concentration of soil is evaluated using the mass loading factor approach with a particulate  
36      air concentration to 50 µg/m<sup>3</sup> of soil in air.

37

38      **Food Crops.** Food crops are evaluated as fruits and vegetables for the resident gardener scenario.  
39      The crops are contaminated when soil contamination (from airborne deposition or irrigation water  
40      application) transfers to the edible parts of the plant by root uptake. The resident gardener is assumed to  
41      eat food crops at a rate of 42 g/day (1.48 oz/d) of fruit and 80 g/day (2.82 oz/d) of vegetables throughout  
42      each year of the 30-year exposure period. The soil concentration is based on a soil mixing depth of 15 cm  
43      (5.9 in.) and a soil density of 1.5 g/cm<sup>3</sup>, which is equivalent to an areal soil density of 225 kg/m<sup>2</sup>.

44

1       **Game (Deer).** For the resident gardener scenario, the individual is assumed to hunt and kill one deer  
2 in the year. The deer becomes contaminated when foraging on plants grown in contaminated soil. The  
3 HSRAM scenario applies a hunter success rate of 19 percent for a season. This percentage is appropriate  
4 when the exposure duration is many years (30 years for HSRAM), but is not appropriate when  
5 considering a one-year period. The annual dose analysis must assume the hunter is successful (a success  
6 rate equal to 100 percent for the year of exposure). Also, the HSRAM intake rate for deer meat is based  
7 on the amount of animal fat in the consumed meat. Although this assumption may be appropriate for  
8 organic chemical pollutants that are lipophilic, it is not generally appropriate for radionuclides. Also, the  
9 exposure pathway models for radionuclides evaluate the activity in the edible meat, not fat. The intake  
10 rate for deer meat, therefore, must be adjusted to represent the amount of meat ingested. This value is  
11 15 g/day (0.53 oz/d), as calculated and reported for the recreational scenario of the Columbia River  
12 Comprehensive Impact Assessment (CRCIA) project (DOE-RL 1998).

13  
14       **Meat and Milk Ingestion.** Individuals in the resident gardener scenario are assumed to ingest  
15 75 g/day (2.65 oz/d) of meat (other than game), and 300 g/day (10.6 oz/d) of dairy products (represented  
16 as milk). The animal product becomes contaminated when the animal eats feed crops contaminated by  
17 root uptake from contaminated soil.

18       **F.1.4.4 Air Transport Medium**

21       Airborne activity may result in inhalation exposure plus direct transfer to plant surfaces, resulting in  
22 intake of contaminated food crops and animal products (from animals that eat contaminated feed crops).  
23 The parameter values for each exposure pathway related to air as a medium have been presented in  
24 Tables F.36 and F.38 for the two exposure scenarios. Notes on the exposure pathways follow.

25  
26       **Inhalation.** For the two HSRAM scenarios, the individual inhales 20 m<sup>3</sup> (706 ft<sup>3</sup>) of air during the  
27 time the individual is present. For the industrial worker, this volume of air is inhaled during an 8-hour  
28 period, during which the individuals are engaged in enhanced physical activity. For the resident gardener,  
29 the air is inhaled during a 24-hour period at average daily inhalation rates. The industrial worker is  
30 exposed 250 days per year; the resident gardener is exposed 365 days per year.

31  
32       **Food Crops.** Food crops are evaluated as fruits and vegetables for the resident gardener scenario.  
33 The crops are contaminated when airborne contamination transfers directly to the plant surface and is  
34 incorporated into edible parts of the plant. Parameters for this pathway are defined in Section F.1.4.3.

35  
36       **Game (Deer).** For the resident gardener scenario, the individual is assumed to hunt and kill one deer  
37 in the year. The dose for this pathway is evaluated as described under Section F.1.4.3. Deer are  
38 potentially contaminated for the air transport medium when they eat plants contaminated from direct air  
39 deposition onto plant surfaces plus root uptake of airborne deposition onto soil.

40  
41       **Meat and Milk Ingestion.** The animals are exposed from eating feed crops that may be  
42 contaminated by direct air deposition plus root uptake of airborne deposition onto soil. Parameters for  
43 these pathways are defined in Section F.1.4.3.

1           **F.1.4.5 Waterborne Transport Medium**

2  
3       Waterborne activity may result in exposure from domestic water uses and irrigation water uses.  
4       Groundwater used to supply drinking water for domestic water for residences can result in exposure via  
5       water ingestion, inhalation of volatile chemicals released during showering and washing, and dermal  
6       contact during bathing. The parameter values for each exposure pathway related to groundwater as a  
7       medium have been presented in Tables F.36 and F.38. Notes on the exposure pathways follow.

8  
9       **Ingestion of Drinking Water.** The resident gardener consumes 2 L/day (0.53 gal/d) during each day  
10      of the year.

11  
12      **Indoor Air Inhalation.** Individuals may be exposed to contaminated indoor air from volatilization  
13      of chemicals from indoor uses of domestic water. This exposure includes air inhalation while showering.  
14      The resident gardener is exposed daily with a breathing rate of 20 m<sup>3</sup> (706 ft<sup>3</sup>) per day.

15  
16      **Sauna or Sweat Lodge Air Inhalation.** Individuals who participate in sauna or sweat lodge activity  
17      may be exposed to contaminated air from the contaminants in water used to generate humidity. The  
18      amount of a pollutant transferred to air from the water is dependent on the physical properties (volatility)  
19      of the pollutant and the amount of water used. The typical use of water is 4 L (1.01 gal) over a 1-hour  
20      period. Volatile chemicals could be totally transferred to the air. Using a sauna or sweat lodge volume  
21      based on a 2-m (6.6-ft) diameter hemisphere (Harris and Harper 1997), the transfer factor is 1.9 L/m<sup>3</sup>  
22      (4 L [1.01 gal]) water per volume of 2-m (6.6-ft) diameter hemisphere. This value relates the air  
23      concentration inside the sauna or sweat lodge to the water concentration used to generate the humidity.

24  
25      The transfer of non-volatile compounds (and most radionuclides) is determined by the amount of  
26      water vapor that can be held in the air. Excess water vapor (and associated non-volatile pollutants) would  
27      condense and be removed from the air. The estimated transfer factor of 0.3 L/m<sup>3</sup> is based on recommen-  
28      dations of Harris and Harper (1997) and is intended to maximize the concentration of non-volatile  
29      compounds in the air.

30  
31      **Water Dermal Contact.** Individuals may be exposed to contaminated water while bathing. Dermal  
32      absorption of chemicals in shower water is evaluated using methods recommended by the EPA  
33      (EPA 1992). Residents are exposed each day of the year.

34  
35      **Food Crops, Game (Deer), Meat, and Milk Ingestion.** Parameter values for these exposure  
36      pathways are as defined in Section F.1.4.3.

37  
38           **F.1.5 Soil Accumulation Model**

39  
40      The accumulation of pollutants in soil is represented using a box model with loss rate constants to  
41      represent radioactive decay, leaching, and volatilization of volatile and semi-volatile compounds.

42  
43      The losses from volatilization are represented by a loss rate constant that was evaluated based on  
44      physical properties of the chemical. The loss rate constants were evaluated using the volatilization model

1 of Streile et al. (1996) with soil parameters defined for Hanford agricultural soil (Sandy Loam). The  
 2 evaluation was performed using the MEPAS 4.0 source term component under the FRAMES operating  
 3 system (Whelan et al. 1997). The estimated half times are presented in Table F.41.

4  
 5                   **Table F.41.** Volatilization Half Times for Soil  
 6

Chemical	Soil Half Time Volatilization (Days)
Acetone	4.00E+02
Bromodichloromethane	3.80E+02
Carbon tetrachloride	1.20E+02
Dichloromethane	5.10E+01
Diesel fuel	8.50E+03
Hydraulic fluid	8.70E+03
Methyl ethyl ketone	8.40E+02
Polychlorinated biphenyls (PCBs)	4.40E+04
p-chloroaniline	1.40E+04
Toluene	2.70E+02
1,1,1 Trichloroethane	2.30E+02
Xylene	2.20E+02
(a) PCBs = polychlorinated biphenyls.	

7  
 8         The losses from radioactive decay (and progeny generation) are evaluated using the general decay  
 9 algorithm of Strenge (1997).

10  
 11         The leaching losses from the surface soil layer are evaluated from the distribution coefficient ( $K_d$ )  
 12 value as shown in Equation F.2.

13

$$I_i = \frac{I}{h q \left(1 + \frac{b_d}{q} k_{di}\right)} \quad (F.2)$$

14         where  $\lambda_i$  = loss rate constant for pollutant i from surface soils (1/yr)

15            I = total infiltration rate (cm/yr)

16            h = thickness of the surface-soil layer (cm)

17            θ = moisture content of the surface-soil layer (fraction)

18             $b_d$  = bulk density of the surface-soil layer (g/cm<sup>3</sup>).

19             $k_{di}$  = distribution coefficient for pollutant i (mL/g)

Evaluation of the leach rate constant requires an estimate of the  $K_d$  for each contaminant. The following paragraphs describe the method used to evaluate the  $K_d$  values for radionuclides and chemicals.

Values used for the distribution coefficient were selected to give low leach rate constants (high retention times). This selection would result in a conservative (high) estimate of radiation dose or chemical intake for those exposure pathways that involve accumulation in soil. The parameters for agricultural soil are used for all exposure pathways, as a simplification to the analysis and a further conservatism for the residential exposure pathways. Residential soil would be expected to involve mixing in a smaller depth (represented in Equation F.2 by parameter  $h$ ). A smaller value for soil depth would result in a faster leach rate and lower equilibrium concentrations. Residential and industrial soils are assumed subject to the same infiltration rate as agricultural lands because of lawn watering.

#### F.1.5.1 Evaluation of Distribution Coefficient for Organic Chemicals

The general algorithm for estimation of  $K_d$  values for organic chemicals is taken from Stenget and Peterson (1989) as shown in Equations F.3 and F.4:

$$K_d = 0.0001 K_{oc} S_d \quad (F.3)$$

where  $K_d$  = distribution coefficient (mL/g)

$K_{oc}$  = carbon matter water distribution coefficient (mL/g)

$S_d$  = soil distribution coefficient (dimensionless)

0.0001 = empirical coefficient.

The soil distribution coefficient is evaluated based on soil properties as follows:

$$S_d = 57.735 (\% \text{ organic matter}) + 2.0 (\% \text{ clay}) + 0.4 (\% \text{ silt}) + 0.005 (\% \text{ sand}) \quad (\text{F.4})$$

where the empirical coefficients have units of 1 percent.

As this equation indicates, the soil composition is important to the evaluation of the  $K_d$ . For the present analysis, the soil type is based on an agricultural soil composed of typical Hanford soil, with the carbon matter composition based on typical agricultural soils. Surface soils of Hanford are dominated by Ruppert Sand, Ephrata Sandy Loam, and Burbank Loamy Sand (see Section 4.3.4). The approximate composition of these soils is indicated in Table F.42.

**Table F.42.** Soil Classification Composition

<b>Soil Classification</b>	<b>% Sand</b>	<b>% Silt</b>	<b>% Clay</b>
Sand	92	5	3
Loamy Sand	83	11	6
Sandy Loam	65	25	10

The properties of Sandy Loam provide higher estimates of  $K_d$  than the other two soil types because clay results in a higher contribution to the soil distribution coefficient than the other two components. Typical agricultural soils contain about 1.2 percent organic carbon (Connor and Shacklette 1975). Assuming the weight of organic carbon is about half of the weight of the organic matter, the total content of organic matter is about 2.4 percent.

The estimate of  $S_d$  and  $K_d$  is based on Sandy Loam with a carbon matter content of 2.4 percent, with the carbon matter percent value replacing sand. The net composition is 62.6 percent sand, 25 percent silt, 10 percent clay, and 2.4 percent carbon matter. This soil composition results in a value of 169 for  $S_d$ .

The  $K_{oc}$  values are taken from the MEPAS chemical database. Evaluation of  $K_d$  values is indicated in Table F.43 for the hazardous organic chemicals in the waste stream inventories.

**Table F.43.** Soil-Related Properties of Hazardous Organic Chemicals

<b>Chemical</b>	<b>K<sub>oc</sub></b>	<b>K<sub>d</sub></b>
Beryllium	-- <sup>(a)</sup>	1.0E+02
Nitric acid	--	1.0E+01
Sodium nitrate	--	1.0E+01
Sodium hydroxide	--	1.0E+01
1,1,1 trichloroethane	1.52E+02	2.57E+00
Polychlorinated biphenyls	6.10E+05	1.03E+04
p-chloroaniline	4.17E+01	7.04E-01
Carbon tetrachloride	5.02E+02	8.48E+00
Hydraulic fluid	1.40E+04	2.36E+02
Toluene	3.00E+02	5.07E+00
Formic acid	1.8E-01	3.04E-03
Dichloromethane	8.8E+0	1.49E-01
Acetone	5.75E-01	9.7E-02
Methyl ethyl ketone (MEK)	4.5E+0	7.6E-02
Diesel fuels	4.50E+03	7.6E+01
Xylene	2.40E+02	4.05E+00
Mercury	--	8.00E+04
Bromodichloromethane	1.07E+02	1.81E+00

1      **F.1.5.2 Evaluation of Distribution Coefficients for Radionuclides and Inorganic  
2                   Chemicals**

3

4      The distribution coefficient values for radionuclides and inorganic chemicals were selected based on a  
5      literature review values for the inorganic chemicals and radionuclide elements in the waste stream  
6      inventories. The selected  $K_d$  values are listed in Table F.44.

7

8      The  $K_d$  value for sodium nitrate, sodium hydroxide, and nitric acid are based on the value used for  
9      potassium-40, and the value for mercury is the same as the value for lead. The values are based primarily  
10     on chemical similarity and solubility. The value for beryllium is a default value set to cause very little  
11     leaching (a conservative estimate for impacts).

12

13     **Table F.44.** Distribution Coefficients of Radionuclides and Inorganic Chemicals

14

Analyte Name <sup>(a)</sup>	Distribution Coefficient (mg/g)
Americium	5000
Beryllium	100
Bismuth	900
Cesium	100
Cobalt	100
Curium	1500
Iron	100
Lead	80,000
Manganese	2400
Mercury	80,000
Neptunium	1500
Nickel	2400
Nitrate	10
Nitrite	10
Plutonium	5000
Polonium	1100
Protactinium	3600
Radium	500
Radon	0.1
Sodium hydroxide	10
Strontium	180
Thorium	600,000
Tritium	0.7
Uranium	7
Yttrium	1500

(a) The distribution coefficient applies to all isotopes of the listed element.

1      **F.1.6 Health Impacts**

2

3      The evaluation of annual radiation dose is based on radiation dose conversion factors as published in  
4      Federal Guidance Reports Nos. 11 and 12 (Eckerman et al. 1988; Eckerman and Ryman 1993). These  
5      dose factors are based on recommendations of the International Commission on Radiological Protection  
6      (ICRP) as given in ICRP Publication 30 (ICRP 1979, 1980, 1981, 1988). The resulting doses represent  
7      the effective dose equivalent received over a commitment period of 50 years following intake in the  
8      first year.

9

10     For non-carcinogenic chemicals, the health endpoint is the hazard quotient defined by EPA as the  
11    average daily intake of a chemical divided by the reference dose (RfD) for that chemical. The hazard  
12    quotient is evaluated for both inhalation exposures and ingestion exposures with RfD determined for each  
13    route. For carcinogenic chemicals, the health endpoint is the lifetime cancer incidence from the defined  
14    total intake.

15

16     The evaluation of radiation dose as the endpoint in the analysis is a deviation from the guidance in the  
17    HSRAM report (DOE-RL 1995). The HSRAM report describes evaluation of the lifetime cancer  
18    incidence risk from radionuclides using slope factors. The slope factors relate intake (pCi) to the lifetime  
19    cancer incidence risk. However, the present analysis requires evaluation of annual radiation dose. The  
20    use of slope factors has, therefore, been replaced in the present analysis by use of radiation dose  
21    conversion factors.

22

23      **F.1.7 Basis for Radiological Health Consequences**

24

25     Estimates of consequences from radiological exposures to workers and the public are based on  
26    recommendations of the EPA, as presented in Federal Guidance Report 13 (Eckerman et al. 1999). The  
27    consequences in terms of LCFs and total detrimental health effects are presented in Table F.45 for both  
28    adult workers and the general population. The total incidence of detrimental health effects includes both  
29    fatal and non-fatal cancers and severe hereditary effects.

30

31     The EPA recommendations are similar to those of the ICRP (1991), which are shown in Table F.46.  
32    Again, the total incidence of detrimental health effects includes both fatal and non-fatal cancers and  
33    severe hereditary effects. The higher rates for health effects in the general population account for the  
34    presence of more sensitive individuals, such as children, compared to the relatively homogeneous  
35    population of healthy adults in the workforce. These health effects coefficients are used to estimate the  
36    number of LCFs in populations, or the risk of an LCF to an individual, for the purposes of comparing the  
37    alternatives and activities discussed in this HSW EIS. The ICRP health effects coefficients have been  
38    adopted by the National Council on Radiation Protection and Measurements (NCRP 1993) and are similar  
39    to those developed by other organizations (for example, UNSCEAR 1988; Eckerman et al. 1999). Use of  
40    the health effects coefficients developed by these other organizations would result in conclusions  
41    regarding health effects similar to those presented in this HSW EIS.

42

1           **Table F.45.** Summary of Basis for Health Consequences from Radiological Exposures from  
 2           Federal Guidance Report No. 13 (Eckerman et al. 1999)  
 3

Type of Health Effect	Effects per Unit Radiation Dose <sup>(a)</sup>	Radiation Dose to Produce 1 Effect <sup>(a)</sup>
Latent Cancer Fatality All Individuals	$6 \times 10^{-4}$ /person-rem	1700 person-rem
Total Detriment <sup>(b)</sup> All individuals	$8.5 \times 10^{-4}$ /person-rem	1200 person-rem
(a) To convert person-rem to person-Sv, multiply by 0.01.		
(b) Total Detriment includes fatal and non-fatal cancers and severe hereditary effects.		

4           The health effects coefficients are based on radiation exposures to specific populations and for  
 5           different doses, dose rates, and pathways than those normally encountered in the environment. As a  
 6           result, the health effects coefficients in Table F.46 are subject to substantial uncertainty when applied to  
 7           very low or very high doses, and when extrapolated to estimate health effects in populations different  
 8           from those used to develop them. The NCRP (1997) has estimated the range (90 percent confidence  
 9           interval) of these health effects coefficients to be approximately a factor of two above and below the  
 10          median values presented in Table F.46.

12           The estimation of health effects in a given population is determined by applying the health effects  
 13          coefficients to the collective dose for that population. Collective dose is defined as the sum of doses to all  
 14          individuals in the population who may exhibit a wide range of susceptibility to radiation-induced health  
 15          effects. The health effects coefficients are, therefore, associated with substantial uncertainty when  
 16          applied to dose estimates for individuals whose sensitivity may differ from the population average.  
 17          However, assumptions used to develop the health effects coefficients were intended to be sufficiently  
 18          conservative, in that they would be "...unlikely to underestimate the risks" (ICRP 1991).

21           **Table F.46.** Basis for Health Consequences from Radiological Exposures (from ICRP 1991)

Type of Health Effect	Effects per Unit Radiation Dose <sup>(a)</sup>	Radiation Dose to Produce 1 Effect <sup>(a)</sup>
Latent Cancer Fatality Adult Workers	$4 \times 10^{-4}$ /person-rem	2500 person-rem
General Population	$5 \times 10^{-4}$ /person-rem	2000 person-rem
Total Detriment <sup>(b)</sup> Adult Workers	$5.6 \times 10^{-4}$ /person-rem	1800 person-rem
General Population	$7.3 \times 10^{-4}$ /person-rem	1400 person-rem
(a) To convert person-rem to person-Sv, multiply by 0.01.		
(b) Total Detriment includes fatal and non-fatal cancers and severe hereditary effects		

23           For radiological accidents discussed in this HSW EIS, the doses estimated for some hypothetical  
 24          events may be greater than the doses to which the ICRP health effects coefficients were intended to apply.

1 Depending upon the radionuclides involved and the exposure pathways considered, the LCF risk may be  
2 as much as twice that listed in Table F.45 for doses greater than 20 rem but less than a few hundred rem.  
3 For doses greater than a few hundred rem, there is a potential for short-term health effects other than  
4 cancer and hereditary effects (again, depending upon the radionuclides and exposure pathways associated  
5 with a particular accident scenario). For a further discussion of uncertainties see Section 3.5 in Volume I  
6 of this EIS.

7

### 8 **F.1.8 Comparison of Radiation Risk Results for Children Estimated Using** 9 **Federal Guidance Reports 11 and 13**

10

11 All dose results in this EIS have been estimated using the internal radiation dose conversion factors  
12 recommended in Federal Guidance Report (FGR) 11 (Eckerman et al. 1988). As an approximation,  
13 radiation risks were estimated using an individual dose-to-risk conversion factor of 0.0006 risk of  
14 induction of a latent cancer fatality per rem of dose, as recommended by the Interagency Steering  
15 Committee on Radiation Standards (ISCORS). All estimates presented in this EIS are based on exposure  
16 of adults.

17 Radiation doses and risks to children are different than those to adults for the same concentrations of  
18 contaminants in the environment, because children generally eat and drink less than adults (except  
19 possibly for milk) so their bodies metabolize contaminants differently than adults, and their organs have  
20 different masses than adult organs. In addition, children may have different sensitivities than adults to  
21 radiation for a given radiation dose. FGR 13 (Eckerman et al. 1999) provides tables of ingestion dose and  
22 risk to children for a unit intake of radionuclides that may be used to evaluate the potential differences in  
23 dose and risk to children and adults for given groundwater concentrations of radionuclides of interest in  
24 this EIS.

25 The radiation risks for adults in this EIS are estimated using predicted radionuclide concentrations in  
26 waster, assumed drinking rates, radionuclide-specific radiation dose conversion factors, and a dose-to-risk  
27 conversion. A similar calculation can be done using a drinking rate appropriate for children, and the  
28 radionuclide-specific risk conversion factor. The ratios of annual dose and risks estimated for children,  
29 using a 1 L/day drinking water intake rate, to the annual risk for adults, as calculated in this EIS, are  
30 presented in Table F.47.

31 The EIS approach would over-estimate the risk to children from ingestion of iodine-129, but slightly  
32 underestimate the dose. Doses and risks to children from carbon-14 would be about twice as high as for  
33 adult; however, carbon-14 was found to be a minor contributor to dose for all alternatives. Risks to  
34 children from technetium-99 would be an order of magnitude greater and doses would be a factor of 6  
35 greater. Technetium-99 was found to be a major contributor to drinking water dose for several millennia  
36 and although the risk to children would be higher, the annual dose was found to not exceed 4 mrem using  
37 the higher factor. The methods used for adults are approximately the same for children for isotopes of  
38 uranium.

1           **Table F.47.** Ratios of Dose and Risk to Children over Dose and Risk to Adults  
2           from 1-Year Ingestion of Contaminated Drinking Water  
3

Radionuclide	Dose Ratio (Child/Adult)	Risk Ratio (Child/Adult)
C-14	1.4	2.3
Tc-99	6.0	11
I-129	1.4	0.2
U-233	0.88	1.1
U-234	0.87	1.1
U-235	0.90	1.2
U-236	0.87	1.1
U-238	0.88	1.1

4

## 5           **F.2 Accident Impact Assessment Methods**

6

7           In this HSW EIS, estimates of accident consequences for Hanford waste management facilities and  
8           operations are based on analyses of accident scenarios identified in existing Hanford nuclear facility  
9           safety analyses, including Bushore (2001), Tomaszewski (2001), Vail (2001a, 2001b, 2001c), and  
10          WHC (1991). Details of the accident analyses are presented in these documents and are summarized in  
11          Section 5.11.

12          The accident consequences presented in this HSW EIS differ from those in the Hanford safety  
13          documents because of differences and calculation adjustments that are described in the following  
14          paragraphs. Adjustments were made to the analysis results to update calculations and to meet the needs  
15          of the environmental impact analysis rather than those of the safety analyses for which the analyses were  
16          originally prepared. Except for those changes and adjustments specifically noted, all calculations and  
17          assumptions remain the same.

18          Changes and adjustments to safety document calculations include the following:

- 19
- 20         1. Updated Hanford meteorological data were used to estimate atmospheric dispersion factors.  
21         Composite joint frequency data, including the years 1983 through 1996, were used for this HSW EIS  
22         analysis.
  - 23         2. The environmental impact analysis used 95<sup>th</sup> percentile atmospheric dispersion factors, whereas  
24         safety analyses typically used 99.5 percentile atmospheric dispersion factors. (Building wake and  
25         plume meander factors used in the safety analyses remain incorporated in this HSW EIS consequence  
26         estimates.)
  - 27         3. The locations of the MEI member of the public and the MEI non-involved worker were changed from  
28         those in the safety analyses. For this HSW EIS analysis, the MEI was located at the nearest publicly  
29         accessible location on U.S. State Route 240 (generally 3 to 5 km [1.9 to 3.1 mi] distant), and the  
30         MEI non-involved worker was located at the nearest publicly accessible location on U.S. State Route 240  
31         (generally 3 to 5 km [1.9 to 3.1 mi] distant).

1 maximally exposed non-involved worker was located 100 m (109 yd) away. For the safety analyses,  
2 the MEI member of the public was located at the Hanford Site boundary, typically a distance of  
3 12 km (7.4 mi), and the co-located worker was at the nearest facility, typically a distance of 800 m  
4 (872 yd). The difference in the locations of hypothetically exposed individuals is the most important  
5 reason for differences in the dose estimates between this HSW EIS and safety analyses.

- 6 4. Only the period of plume passage was considered for exposure pathways and doses in this HSW EIS  
7 analysis. Thus, inhalation is the most important exposure pathway, particularly for TRU radio-  
8 nuclides with much smaller contributions from immersion and ground deposition.  
9
- 10 5. Doses are presented only as total effective dose equivalent (TEDE) in this HSW EIS.  
11
- 12 6. This HSW EIS presents estimates of dose and radiological impact (as the probability of LCFs) to  
13 exposed individuals, whereas the safety analyses present only estimates of dose.  
14
- 15 7. This HSW EIS presents estimates of collective dose and radiological impact (as the postulated  
16 number of LCFs) to the exposed population of the general public from an accident scenario. Safety  
17 analyses do not present this information.  
18
- 19 8. The environmental impact analysis used an updated temporary emergency exposure limits (TEELs)  
20 list to evaluate potential impacts from exposure to non-radiological hazardous chemicals. Additional  
21 information on TEELs is presented in Section F.2.3.  
22
- 23 9. This HSW EIS presents estimated impacts from industrial and occupational accidents. Safety  
24 analyses do not present this information. Additional information for each alternative group is  
25 presented under Section 4.10 and in the industrial accidents sections of Section 5.11.  
26

## 27 **F.2.1 Adjustment Method**

28

29 The method for adjusting dose results presented in the safety analyses for the environmental impact  
30 analysis is shown in the following equations (Equations 5.5 through 5.8). It is a simple ratio of acute  
31 release atmospheric dispersion factors (E/Q) and the calculated doses. The E/Q is a measure of  
32 atmospheric dispersion for short-term (acute) atmospheric releases using Gaussian dispersion plume  
33 modeling, with units of s/m<sup>3</sup>. For a given point or location at some distance from the source, it represents  
34 the time-integrated air concentration (Ci·s/m<sup>3</sup>) divided by the total release from the source (Ci). E/Qs are  
35 typically used for releases lasting no longer than 8 to 24 hours. The effective dose equivalent (EDE) used  
36 in the safety analyses (SA) is equivalent to the TEDE used in the environmental impact analysis.  
37

$$38 \frac{TEDE_{EIS}}{EDE_{SA}} = \frac{E / Q_{EIS}}{E / Q_{SA}} \quad (F.5)$$

39 or  
40

$$TEDE_{EIS} = EDE_{SA} * \frac{E/Q_{EIS}}{E/Q_{SA}} \quad (F.6)$$

where EIS = used in this EIS  
SA = used in the SA.

A similar method was used for estimating collective dose to the population within 80 km (50 mi), except that a population-weighted atmospheric dispersion factor was used instead of the single-point dispersion factor. Collective dose estimates were based on the atmospheric dispersion and dose to the maximally exposed individual member of the public presented in the safety analyses.

$$TEDE_{pop,EIS} = EDE_{MEI,SA} * \frac{E/Q_{pop,EIS}}{E/Q_{MEI,SA}} \quad (F.7)$$

where pop,EIS = population – weighted atmospheric factor used in this EIS  
MEI,SA = maximally exposed individual member of the public used in the SA.

A similar method was used for adjusting air concentrations at the point of exposure of individuals to non-radiological hazardous chemicals. These adjusted air concentrations were then compared to the revised TEELs list,

$$C_{EIS} = C_{SA} * \frac{E/Q_{pop,EIS}}{E/Q_{MEI,SA}} \quad (F.8)$$

where C is the air concentration of a particular hazardous chemical at the point of exposure.

Table F.46 presents the atmospheric dispersion parameters used in the accident analysis for the onsite non-involved worker, and offsite locations of the exposed individuals and population.

## F.2.2 Accident Frequency

As part of the safety analysis process, a preliminary hazard analysis was performed to identify potential accident scenarios for each facility. Accident scenarios in each of three frequency categories were selected for further analysis. The accidents selected for evaluation represent what were considered the bounding consequences for the frequency category, although other accidents in the frequency category may also have been analyzed to better represent the range of potential impacts. It is important to note that in this HSW EIS, accident consequences are presented without regard to frequency of occurrence and that estimated frequencies of the accidents were not incorporated into the statement of risk.

1      **F.2.3 Non-Radiological Impact Endpoints**

2

3      Estimates of consequences of exposure to potentially hazardous chemicals were based on one-hour  
4      exposures, consistent with the assumptions of the Emergency Response Planning Guidelines (ERPGs).  
5      Also used were TEELs that are interim, temporary, or equivalent exposure limits for chemicals for which  
6      official ERPGs have not yet been developed. At its April 1996 meeting in Knoxville, Tennessee, the  
7      DOE Subcommittee on Consequence Assessment and Protective Actions (SCAPA) adopted the term  
8      TEEL. These exposure limits must be regarded as dynamic; if new concentration limits are issued (for  
9      example, ERPG, permissible exposure level, or threshold limit value) or if new or additional toxicity data  
10     are found, the TEEL would be revised. At the time of this analysis, TEEL values were provided for over  
11     1,340 additional chemicals. ERPGs adopted through January 1, 2000, are located on the SCAPA Internet  
12     Web site (DOE 2002). The most recent TEELs list revision is *ERPGs and TEELs for Chemicals of*  
13     *Concern: Rev 18* (Craig 2001).

14

15     Potential consequences of exposure to hazardous materials are evaluated by comparing them to the air  
16     concentrations of the applicable ERPG or TEEL. Definitions for the different TEEL levels are based on  
17     those for ERPGs that follow:

- 18
- 19       • ERPG-1 The maximum concentration in air below which it is believed nearly all individuals could be  
20       exposed for up to one hour without experiencing other than mild transient adverse health effects or  
21       perceiving a clearly defined objectionable odor
  - 22
  - 23       • ERPG-2 The maximum concentration in air below which it is believed nearly all individuals could be  
24       exposed for up to one hour without experiencing or developing irreversible or other serious health  
25       effects or symptoms that could impair their abilities to take protective action
  - 26
  - 27       • ERPG-3 The maximum concentration in air below which it is believed nearly all individuals could be  
28       exposed for up to one hour without experiencing or developing life-threatening health effects.

29     Temporary Emergency Exposure Limits:

30

- 31       • TEEL-1 The maximum concentration in air below which it is believed nearly all individuals could be  
32       exposed without experiencing other than mild transient adverse health effects or perceiving a clearly  
33       defined objectionable odor
- 34
- 35       • TEEL-2 The maximum concentration in air below which it is believed nearly all individuals could be  
36       exposed without experiencing or developing irreversible or other serious health effects or symptoms  
37       that could impair their abilities to take protective action
- 38
- 39       • TEEL-3 The maximum concentration in air below which it is believed nearly all individuals could be  
40       exposed without experiencing or developing life-threatening health effects.

1        It is recommended that, for application of TEELs, the concentration at the receptor point of interest be  
2 calculated as the peak 15-minute time-weighted average concentration. It should be emphasized that  
3 TEELs are default values, following the published methodology (on the SCAPA web page [DOE 2002])  
4 explicitly.

5

#### 6        **F.2.3.1 Impacts from Industrial Accidents**

7

8        Impacts of potential industrial and occupational accidents were predicted using five-year average  
9 statistics for the U.S. DOE Richland Operations Office, reported in Computerized Accident/Incident  
10 Reporting System, or CAIRS, for the years 1996 – 2000 (DOE 2001). The baseline statistics, applied  
11 separately for construction and operations activities, are presented in Section 4.10. Impacts are presented  
12 as the predicted number of total recordable cases, lost workday cases, lost workdays, and fatalities for  
13 construction and operation activities, based on the number of worker-years for that activity. A full-time  
14 worker is assumed to work 2,000 hours per year.

15

### 16        **F.3 Intruder Impact Assessment Methods**

17

18        In the assessment of intruder impacts, inadvertent intrusion is defined as an inadvertent activity that  
19 results in direct contact with the waste from a LLW disposal facility. Two types of inadvertent intrusions  
20 are considered: excavation of a basement for construction of a dwelling and drilling a well. In each case,  
21 the waste would be extracted from the disposal facility and the extracted waste, with the exception of  
22 activated metal and concrete (or grout), is assumed to be indistinguishable from soil. Pathways by which  
23 an intruder might be exposed to radiation from the exhumed waste include the following:

24

- 25        • ingestion of vegetables grown in the contaminated soil
- 26
- 27        • ingestion of soil
- 28
- 29        • inhalation of radionuclides on dust suspended in the air by gardening activities or wind
- 30
- 31        • external exposure to direct radiation from contaminated soil while working in the garden or residing  
32        in the house built on top of the waste disposal facility.

33        Calculations were performed via a spreadsheet using dose rate per unit concentration conversion  
34 factors contained in performance assessments for the disposal of LLW in the LLBGs and peak  
35 radionuclide concentrations (WHC 1995, 1998). Peak radionuclide concentrations are shown in  
36 Table F.48 along with a short description of the waste origin. The peak concentration values are based on  
37 information extracted from the Solid Waste Information Tracking System, or SWITS, database (Anderson  
38 and Hagel 1996; Hagel 1999) and decay corrected to 2046. These radionuclides would not all occur  
39 within the same waste container, or even within the same disposal facility. Therefore, the peak values  
40 represent a hypothetical maximum waste package.

41

1           **Table F.48.** Peak Radionuclide Concentrations in Disposal Facilities (Year 2046)

2

<b>Radiation</b>	<b>Peak Waste Concentration, Ci/m<sup>3</sup></b>	<b>Probable Waste Description</b>
Tritium	6.9E+02	Failed tritium targets
Carbon-14 <sup>(a)</sup>	4.2E+0	Naval core basket
Cobalt-60 <sup>(a)</sup>	5.1E-01	Naval core basket
Nickel-59 <sup>(a)</sup>	5.9E+0	Naval core basket
Nickel-63 <sup>(a)</sup>	4.9E+02	Naval core basket
Strontium-90	1.0E+03	B Plant filters during encapsulation of strontium fluoride
Technetium-99	7.9E-02	Discarded uranium oxide
Iodine-129	5.2E-03	PUREX debris
Cesium-137	4.1E+02	B Plant filters during encapsulation of cesium chloride
Uranium-234	2.4E-01	Discarded uranium oxide
Uranium-235	6.0E-02	Discarded uranium oxide
Uranium-236	2.5E-01	Discarded uranium oxide
Uranium-238	1.5E-01	Discarded uranium oxide
(a) The activity is in activated metal.		

- 3
- 4           **F.3.1 Human Intrusion Exposure Scenarios**
- 5
- 6           Estimation of impacts from inadvertent human intrusion that were considered in this analysis included
- 7           the following hypothetical scenarios: well drilling, post-well drilling gardening, excavation, post-
- 8           excavation gardening, and the deep-root garden. The parameters and values employed for radiation dose
- 9           and associated impacts are presented as follows:
- 10
- 11          1. Well Drilling. A 30-cm (12-in.) diameter well is driven through the waste.
- 12
- 13          2. Post-Well Drilling Gardening. Waste from the well hole is mixed with topsoil in which vegetables
- 14           are grown. The vegetables are consumed as well as incidental soil.
- 15
- 16          3. Excavation. 300 m<sup>3</sup> (11,000 ft<sup>3</sup>) of waste is exhumed during construction of a nominal 139-m<sup>3</sup>
- 17           (1500-ft<sup>2</sup>) house with a basement.
- 18
- 19          4. Post-Excavation Gardening. Waste from the basement excavation is mixed with soil in which
- 20           vegetables are grown. The vegetables are consumed as well as incidental soil.
- 21
- 22          5. Deep-Root Garden. Crop roots, including fruit and nut trees or other natural plant roots (such as
- 23           alfalfa), penetrate the waste zone, thereby contaminating crops or fodder that are consumed in the
- 24           human food chain.
- 25

1       For Category 1 LLW, waste is buried at a depth of about 3 m (10 ft) and would be accessible by  
2       excavation, drilling, or root penetration of fruit and nut trees and alfalfa. Thus, all five scenarios apply.  
3

4       For Category 3 LLW, waste is buried at sufficient depth of 5 m (16 ft) or more to eliminate  
5       excavation for a dwelling house. However, root penetration by fruit and nut trees would still be possible  
6       as a feasible, but minor, means of interacting with the waste. WAC 173-340 states that for soil cleanup  
7       levels based on human exposure via direct contact, the point of compliance is established in the soils  
8       throughout the site from the ground surface to 3.8 m (15 ft) below the ground surface. This estimate  
9       represents a reasonable depth of soil that could be excavated and distributed at the soil surface as a result  
10      of site development activities.) Thus, only the drilling and post-drilling scenarios are applicable based on  
11      depth of the waste. However, Category 3 LLW is contained within concrete high-integrity containers  
12      (HICs) and is considered highly improbable that drilling through HICs would occur. Regardless, this  
13      scenario was selected to reasonably bound consequences of intrusion impacts from wastes under  
14      consideration in this HSW EIS.

15      Evaluation of this intrusion scenario was performed for 100, 500, and 1000 years after the year 2046.  
16      No allowance was given for the modified RCRA Subtitle C cover to be used in capping HSW disposal  
17      facilities in Alternative Groups A and B. Thus, the drilling scenario, as evaluated, applies to all  
18      alternative groups under consideration.

19      In the well drilling operation, 0.35 m<sup>3</sup> (12 ft<sup>3</sup>) waste (from a 0.3-m [12-in.] diameter well assumed to  
20      be drilled through 5 m [16 ft] of waste) is brought to the surface and spread over a 2500-m<sup>2</sup> (0.6-ac)  
21      garden. The resulting redistribution factor results in a value of 1.4E-04 m<sup>3</sup> of waste per m<sup>2</sup> (4.6E-04 ft<sup>3</sup> of  
22      waste per ft<sup>2</sup>). It is assumed the exhumed soil is thoroughly mixed to a depth of 15 cm (6 in.).  
23

24      The area of the garden is a size that would reasonably supply the resident's vegetable diet (Napier  
25      et al. 1984) and has been used in other assessments (for example, Kincaid et al. 1995). The mixing depth  
26      of 15 cm (6 in.) is considered a typical plowing depth for most farming practices. An attempt was made  
27      to be reasonably conservative in the selection of values, so those dose estimates would be bounding.  
28

29      Inhalation and external exposures are based on the following exposure times: the gardener is  
30      assumed to spend 1800 hr/yr outside in the garden and 4380 hr/yr inside. The remaining 2580 hr/yr are  
31      spent elsewhere on the property.

32      A mathematical model is used to calculate the amount of each radionuclide that is brought to the  
33      surface by human intrusion. Estimates of annual frequencies of yearly probabilities for borehole drilling  
34      into the disposal facility with the highest consequence impacts were calculated. The annual probabilities  
35      were derived by multiplying the annual borehole frequency per square kilometer, 0.01/km/yr, by the  
36      surface area occupied by the waste container. This value is more than three times higher than the number  
37      recommended by EPA in 40 CFR 191. For example, in 1976, a 48.9 m<sup>3</sup> box containing 100,000 curies of  
38      cesium-137 was disposed of in the 218-E-10 Burial Ground for a concentration of 2040 Ci/m<sup>3</sup> in HEPA  
39      filters from B-Plant. That concentration of cesium-137 would physically decay to a concentration of  
40      about 410 Ci/m<sup>3</sup> by 2046. This box was assumed to be cubical in shape and, therefore, approximately  
41      3.66 m (12 ft) on a side. This provides an estimate of 13.4 m<sup>2</sup> (1.3E-05 km<sup>2</sup>) of surface area for the  
42      intrusion scenario.  
43

1 container into which the borehole can be drilled. Thus the probability of randomly drilling into and  
2 hitting the container holding the highest radioactivity concentration of cesium-137 would be roughly  
3 1.3E-07 per year.

### 5 F.3.2 Radiological Analysis

7 The dose-rate-per-unit waste concentration factors (mrem/yr per Ci/m<sup>3</sup>) for 13 radionuclides are given  
8 in Table F.49 for the post-well drilling scenario and in Table F.50 for the excavation scenario. The  
9 analysis used the Kennedy and Strenge (1992) concentration ratios and assumed the intrusion to begin at  
10 100, 500, and 1000 years after the year 2046. The dose-rate-per-unit waste concentration factors were  
11 evaluated by setting the initial concentration (that is, at year 2046) of a radionuclide in the waste to  
12 1 Ci/m<sup>3</sup> and then evaluating the intruder scenario at the specified time. The evaluation was based on the  
13 amount of the radionuclide present at the specified time (and any progeny radionuclides that may have  
14 grown in from the parent radionuclide). The dose-rate-per-unit waste concentration factors were  
15 evaluated for all radionuclides assumed to be present in the waste streams contributing to disposal facility  
16 activity. The dose-rate-per-unit waste concentration factors were then multiplied by the given initial  
17 concentration of radionuclides of interest to estimate the final dose results. For given radionuclides, doses  
18 were calculated as a function of time, using the assumption of leaching or not leaching of radionuclides  
19 from the soil during crop growth. For each radionuclide, the exposure pathway providing the largest dose  
20 is also shown in the tables.

21  
22 The dose-rate-per-unit waste concentration factors change with time because of decay of the parent  
23 radionuclide and leaching of radionuclides from the surface soil. The unit dose factors given in  
24 Tables F.49 and F.50 for *without soil leaching* are impacted only by radioactive decay and progeny

25  
26 **Table F.49.** Dose-Rate-per-Unit Waste Concentration Factors (mrem/yr per Ci/m<sup>3</sup>)  
27 for the Post-Well Drilling Scenario, Time Since Year 2046  
28

Nuclide	Without Soil Leaching			Dominant Exposure Pathway
	100 yr	300 yr	500 yr	
Tritium	5.11E-06	6.39E-11	7.99E-16	Soil Ing.
Carbon-14	5.13E+0	5.01E+0	4.89E+0	Vegetable
Cobalt-60	6.26E-03	2.37E-14	8.96E-026	External
Nickel-59	1.19E-01	1.18E-01	1.18E-01	External
Nickel-63	7.85E-02	1.97E-02	4.92E-03	Vegetable
Strontium-90	3.00E+01	2.36E-01	1.85E-03	Vegetable
Technetium-99	2.00E+01	1.99E+01	1.99E+01	Vegetable
Iodine-129	5.47E+01	5.47E+01	5.47E+01	Vegetable
Cesium-137	8.45E+01	8.54E-01	8.63E-03	External
Uranium-234	5.25E+01	5.25E+01	5.25E+01	Inhalation
Uranium-235	1.70E+02	1.84E+02	1.98E+02	External
Uranium-236	4.91E+01	4.91E+01	4.91E+01	Inhalation
Uranium-238	8.18E+01	8.18E+01	8.18E+01	Inhalation

1           **Table F.50.** Dose-Rate-per-Unit Waste Concentration Factors (mrem/yr per Ci/m<sup>3</sup>)  
 2           for the Excavation Scenario, Time Since Year 2046  
 3

Nuclide	Without Soil Leaching			Dominant Exposure Pathway
	100 yr	300 yr	500 yr	
Tritium	1.09E-03	1.37E-08	1.71E-13	Soil Ing.
Carbon-14	1.10E+03	1.07E+03	1.05E+03	Vegetable
Cobalt-60	1.34E+0	5.07E-12	1.92E-023	External
Nickel-59	2.53E+03	2.53E+01	2.53E+01	External
Nickel-63	1.68E+01	4.21E+0	1.05E+0	Vegetable
Strontium-90	6.43E+03	5.05E+01	3.96E-01	Vegetable
Technetium-99	4.28E+03	4.27E+03	4.27E+03	Vegetable
Iodine-129	1.17E+04	1.17E+04	1.17E+04	Vegetable
Cesium-137	1.81E+04	1.83E+02	1.85E+0	External
Uranium-234	1.13E+04	1.12E+04	1.12E+04	Inhalation
Uranium-235	3.63E+04	3.94E+04	4.25E+04	External
Uranium-236	1.05E+04	1.05E+04	1.05E+04	Inhalation
Uranium-238	1.75E+04	1.75E+04	1.75E+04	Inhalation

4           ingrowth. These dose factors generally decrease with time as the parent decays, although progeny  
 5           ingrowth may cause an increase with time. For example, the uranium-235 dose-rate-per-unit waste  
 6           concentration factors increase with time because of the ingrowth of protactinium-231. The dose-rate-per-  
 7           unit waste concentration factors for *with soil leaching* are impacted by decay and leaching and are less  
 8           than or equal to the corresponding value for no leaching.  
 9

## 10           **F.4 Impacts from Waterborne Pathways**

11           This section presents additional results to those presented in Section 5.11 for the groundwater  
 12           analyses, including examples of contributions to impacts by waste type and radionuclide and summaries  
 13           of potential impacts to the resident gardener at the 1-km points of analysis and the Columbia River point  
 14           of analysis for all alternative groups.  
 15

16           Graphs of contributions to drinking water dose by radionuclide are presented in the following figures  
 17           for all alternative groups and for the Hanford Only and Upper Bound waste volumes. For the No Action  
 18           Alternative, the results are presented only for the Hanford Only waste volume, as the results are  
 19           very similar to those for the Lower Bound waste volume. The content for each figure is indicated in  
 20           Table F.51.  
 21

22

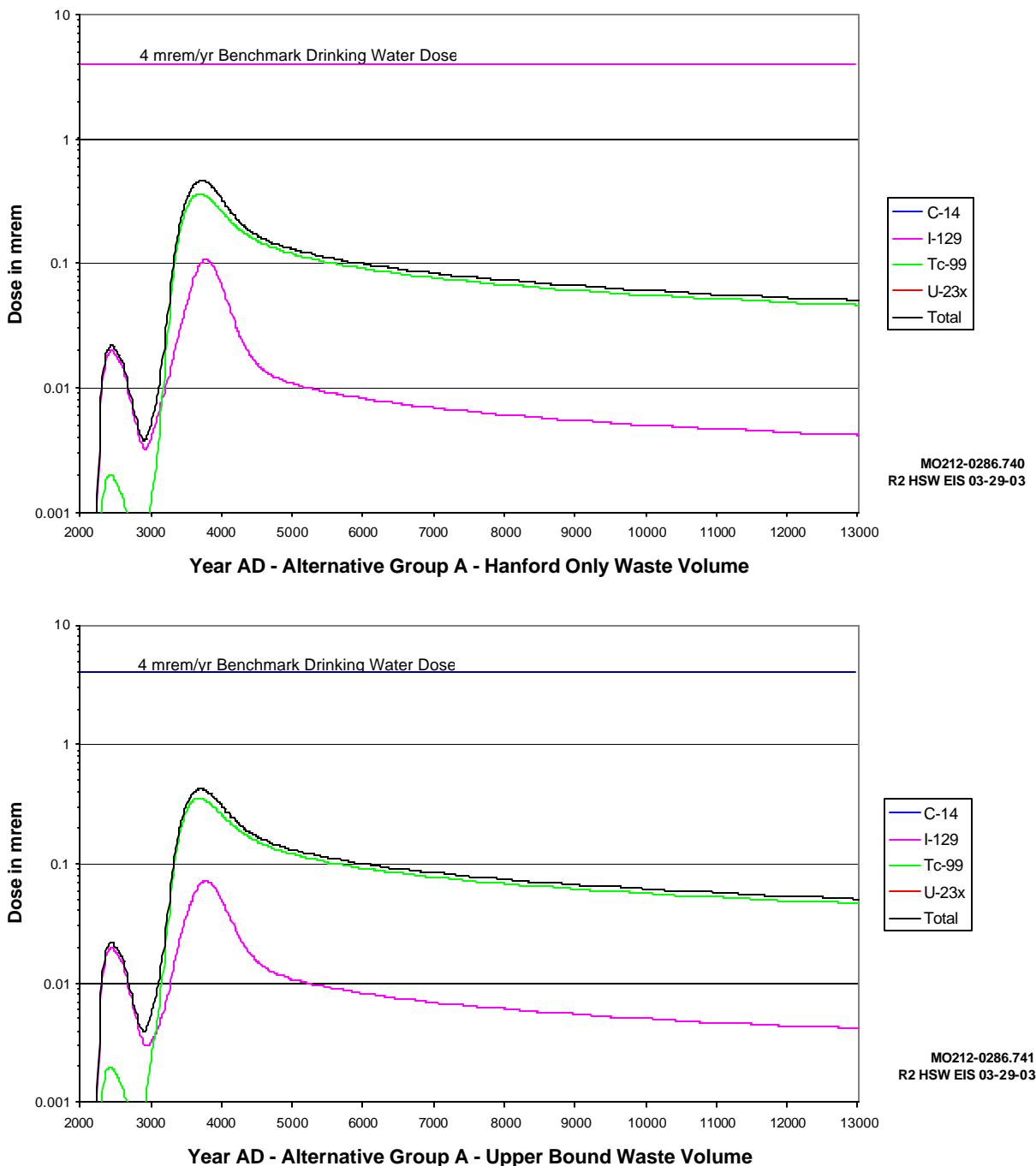
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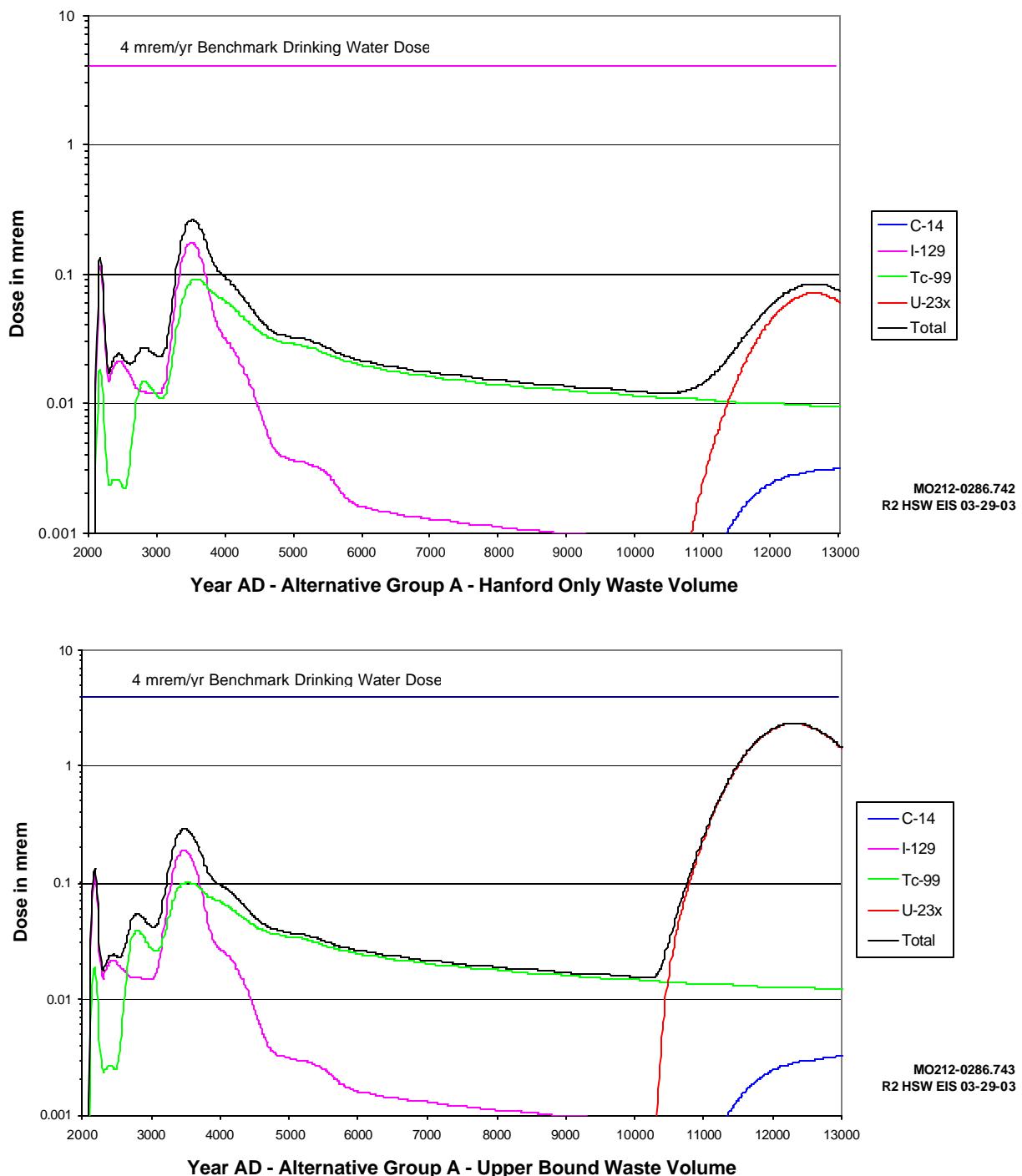
**Table F.51.** Content of Figures for Groundwater Analysis Results

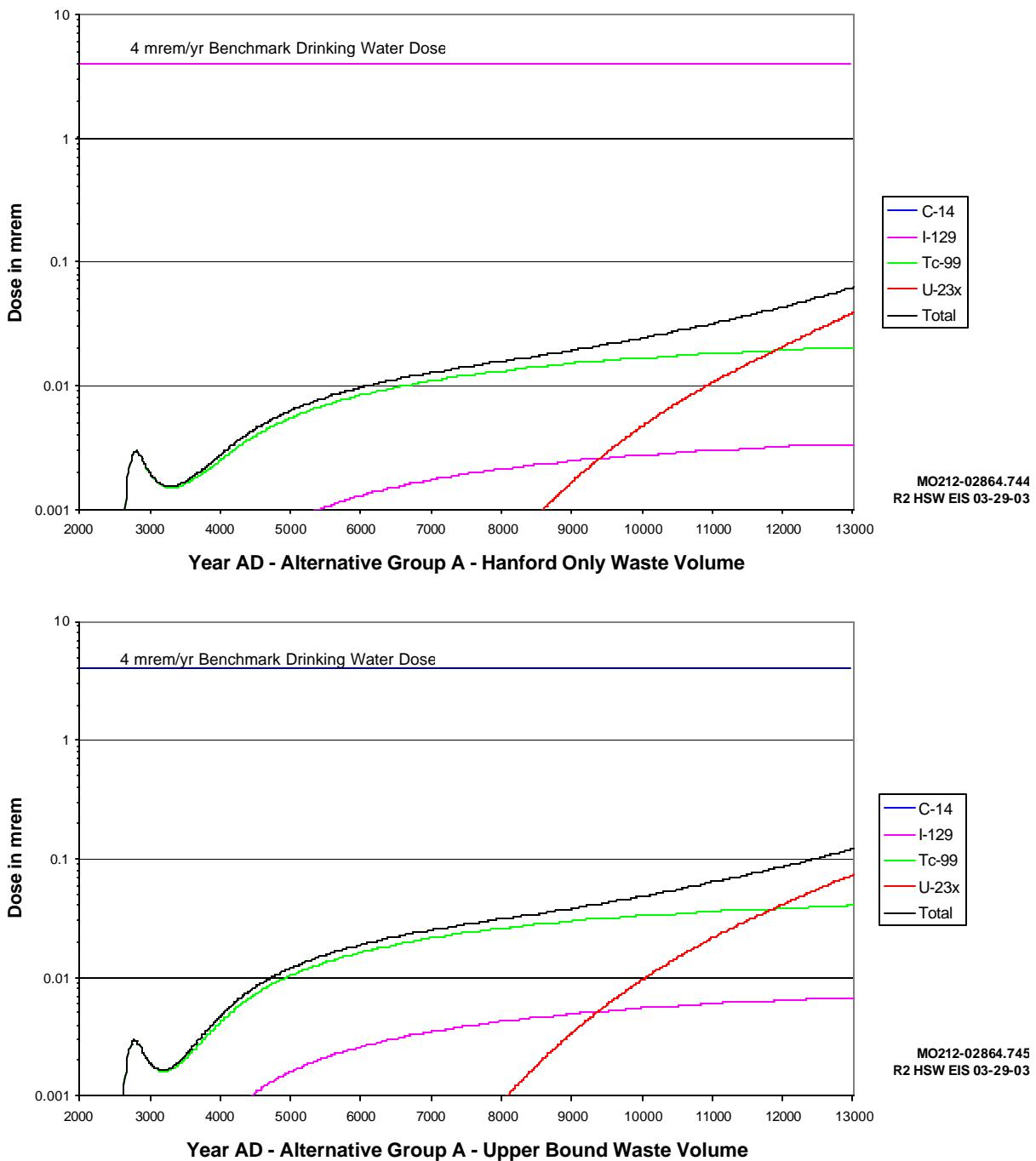
Alternative Group	Line of Analysis				
	200 West	ERDF	200 East NW	200 East SE	Columbia River
Group A	F.1	N/A	F.2	F.3	F.4
Group B	F.5	N/A	F.6	N/A	F.7
Group C	F.8	N/A	F.9	F.10	F.11
Group D <sub>1</sub>	F.12	N/A	F.13	F.14	F.15
Group D <sub>2</sub>	F.16	N/A	F.17	N/A	F.18
Group D <sub>3</sub>	F.19	F.20	F.21	N/A	F.22
Group E <sub>1</sub>	F.23	F.24	F.25	N/A	F.26
Group E <sub>2</sub>	F.27	F.28	F.29	F.30	F.31
Group E <sub>3</sub>	F.32	F.33	F.34	F.35	F.36
No Action	F.37	N/A	F.38	N/A	F.39

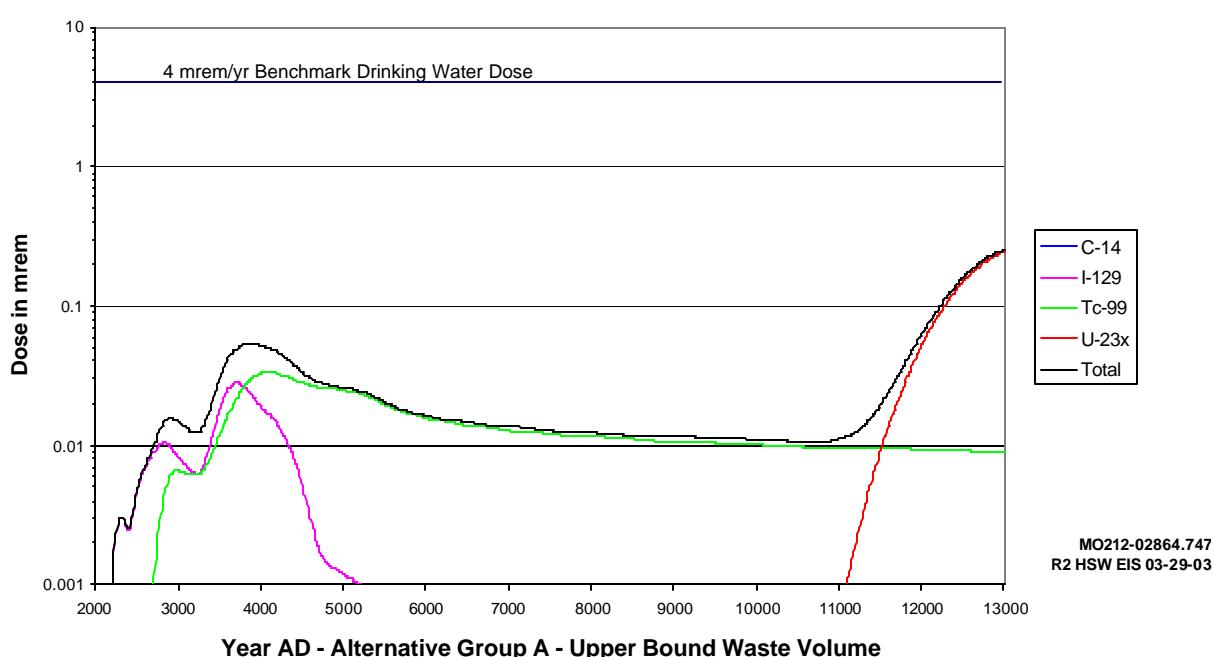
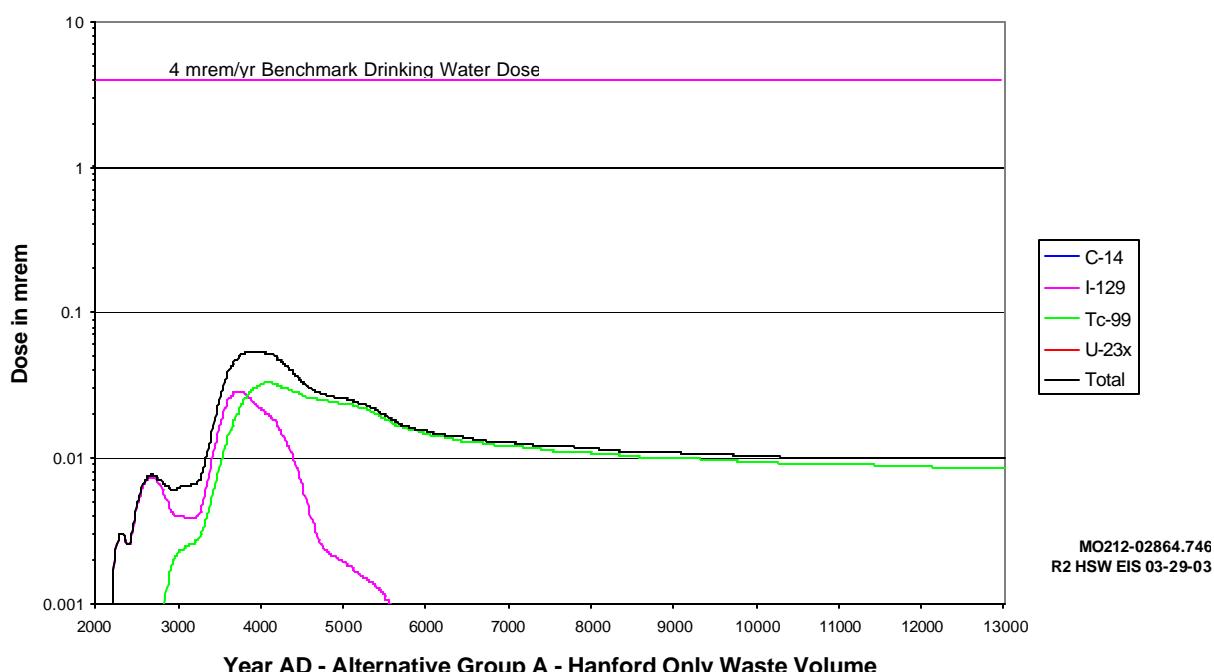
N/A = not applicable.

3

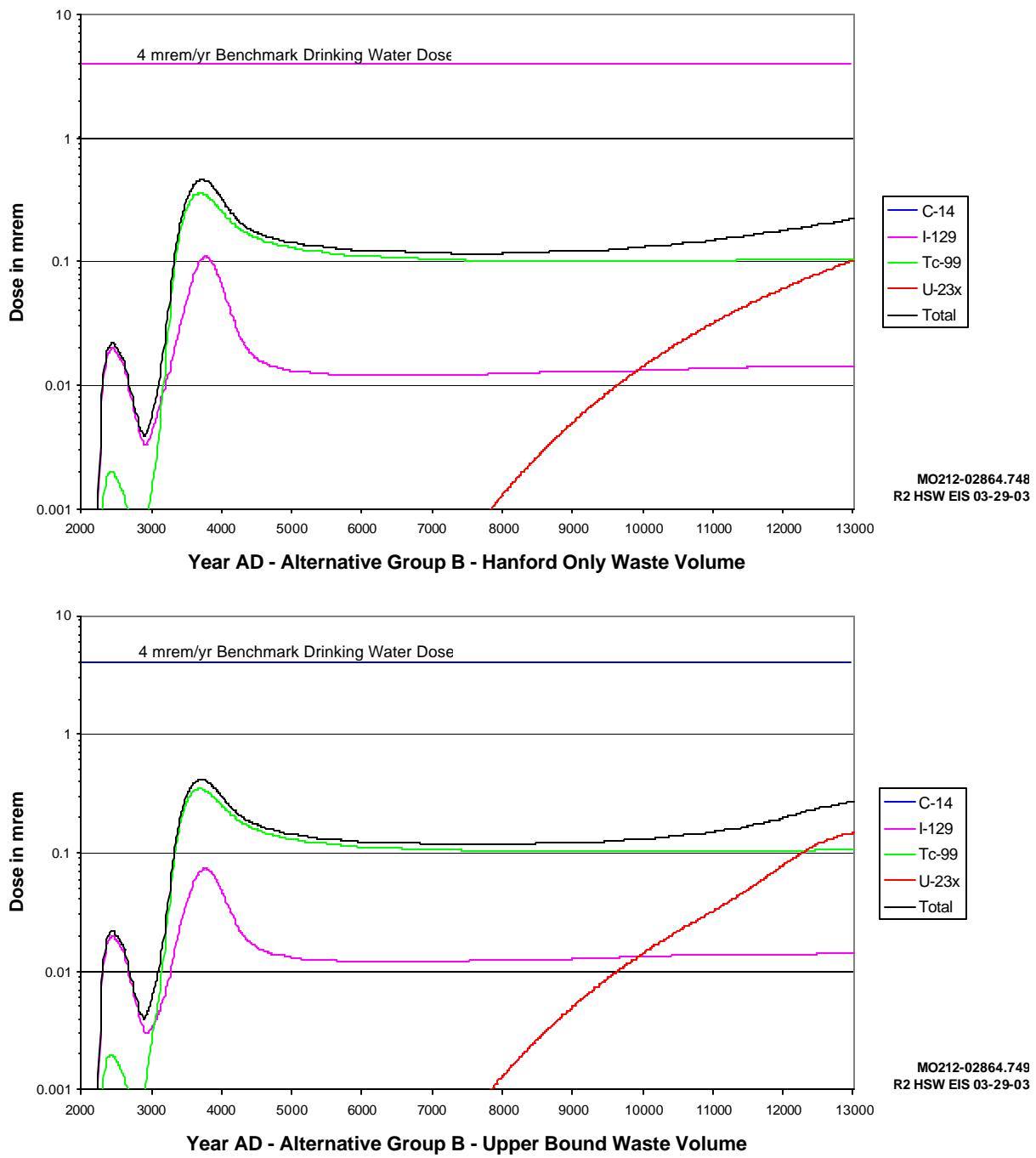


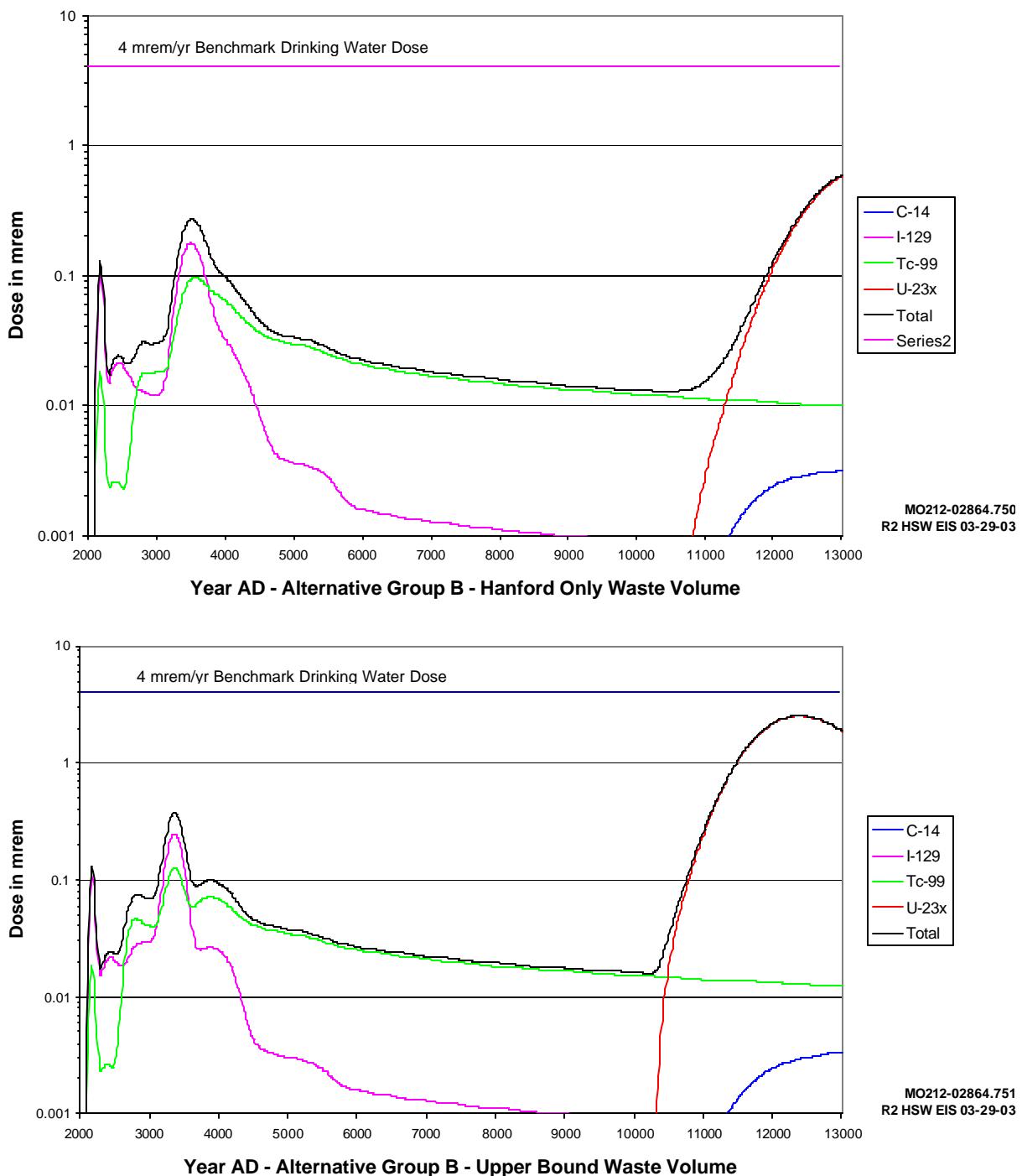


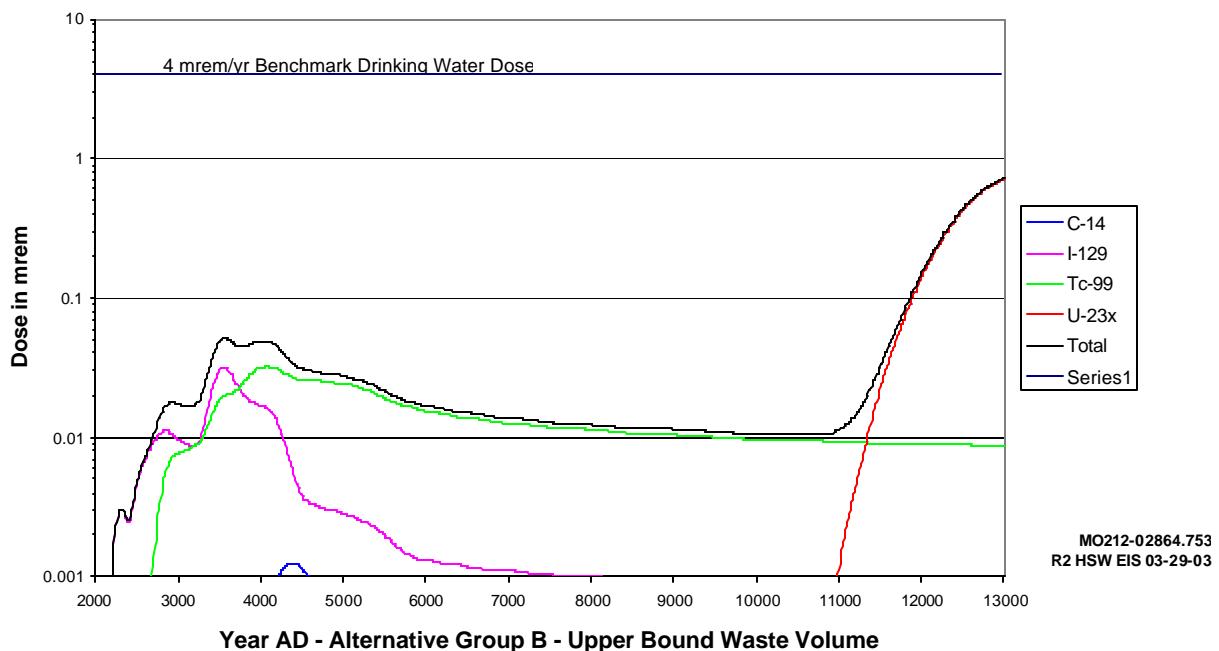
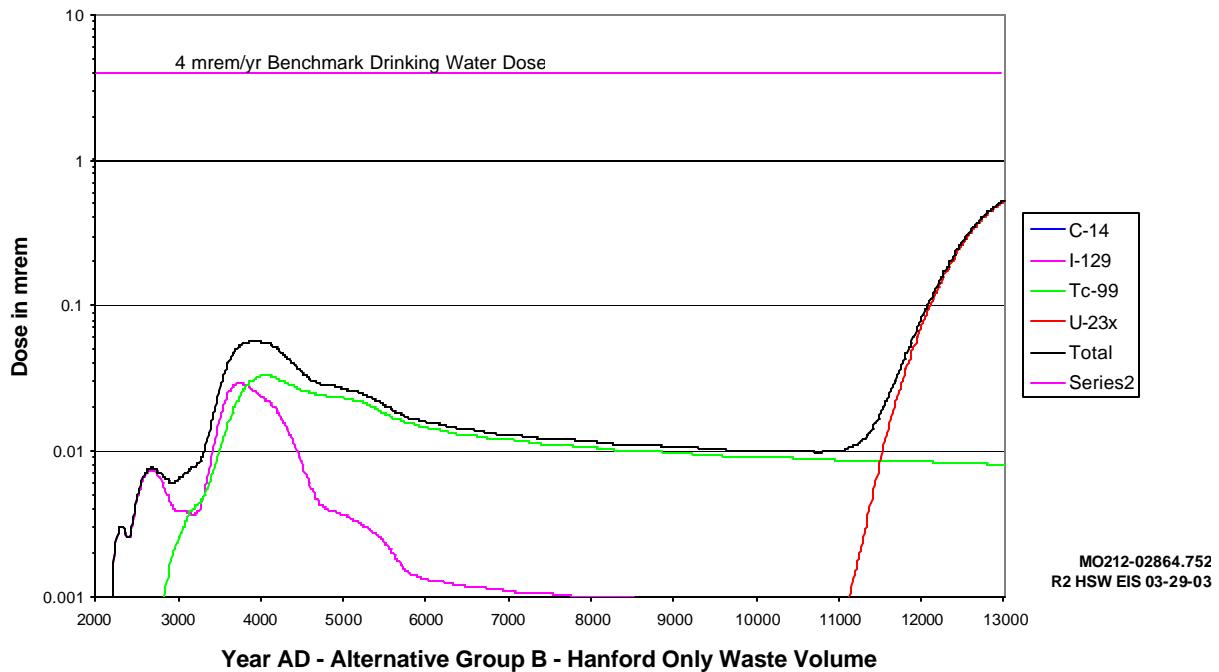




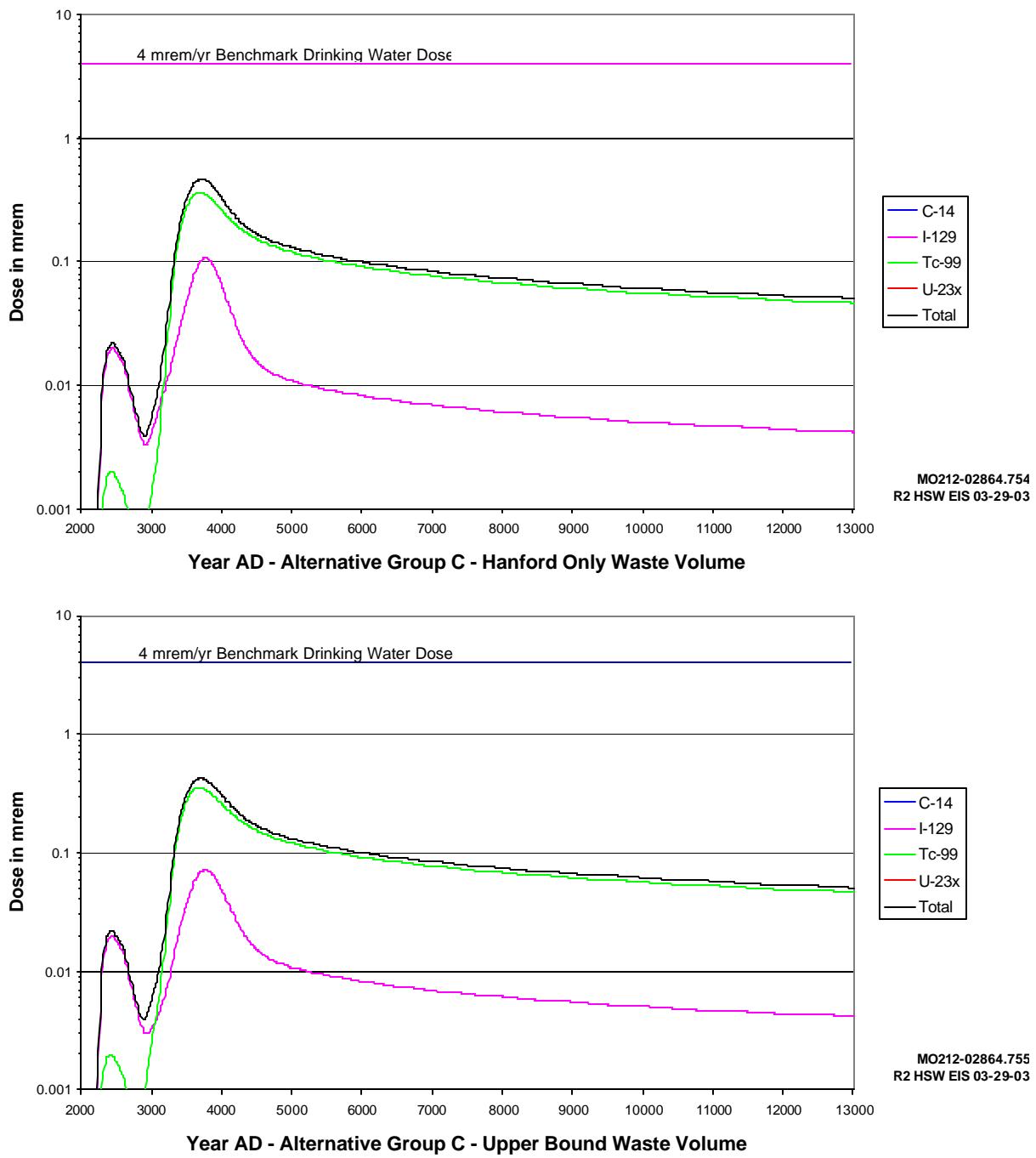
**Figure F.4.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well Adjacent to the Columbia River Alternative Group A

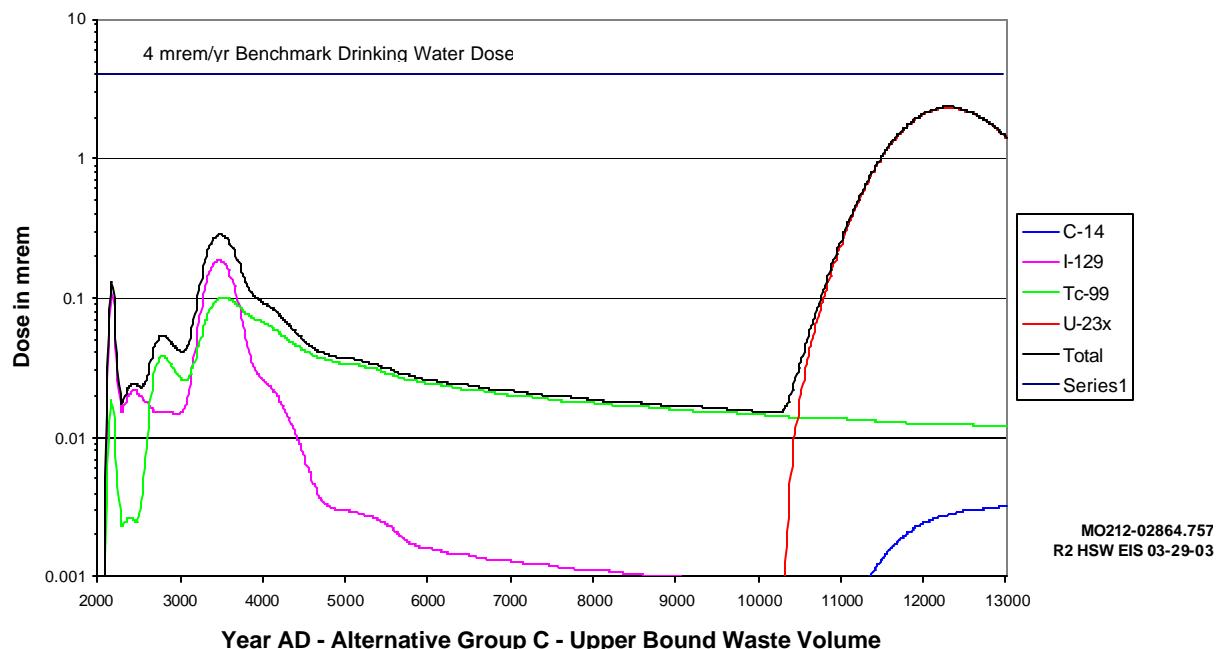
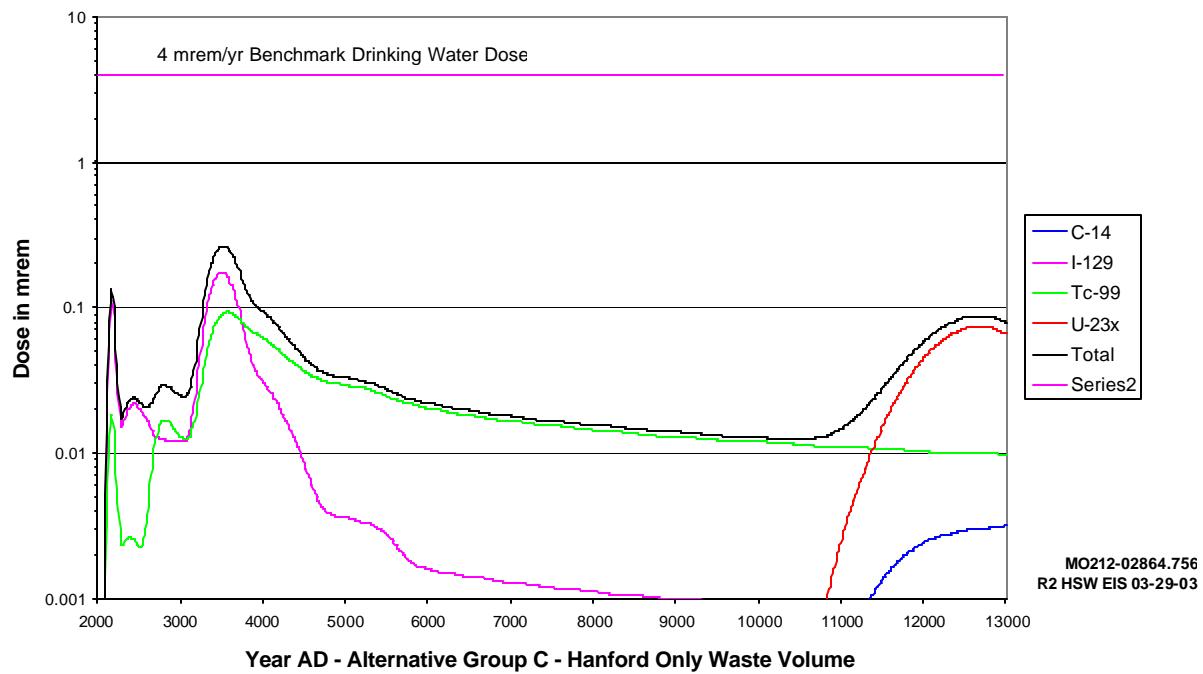




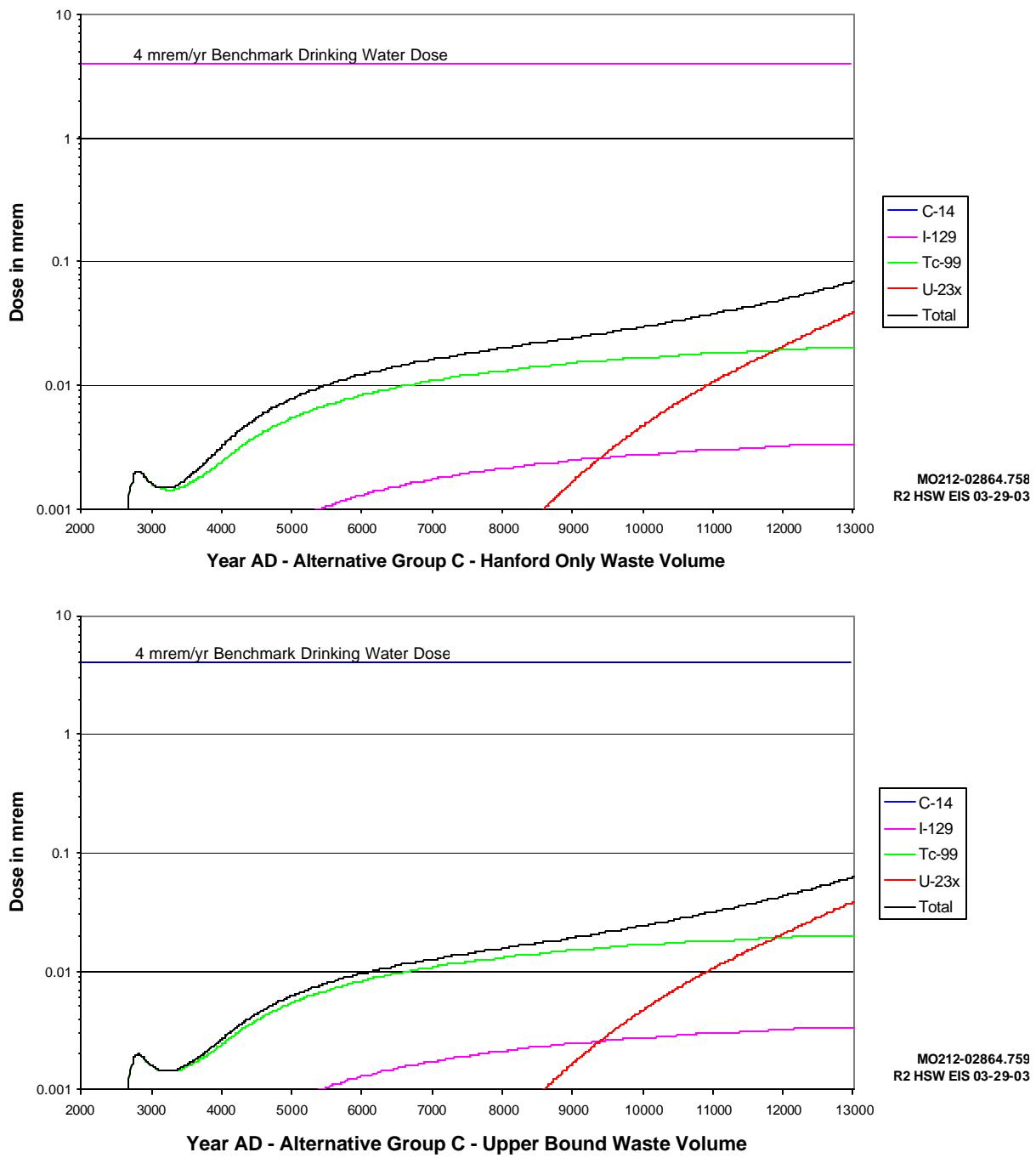


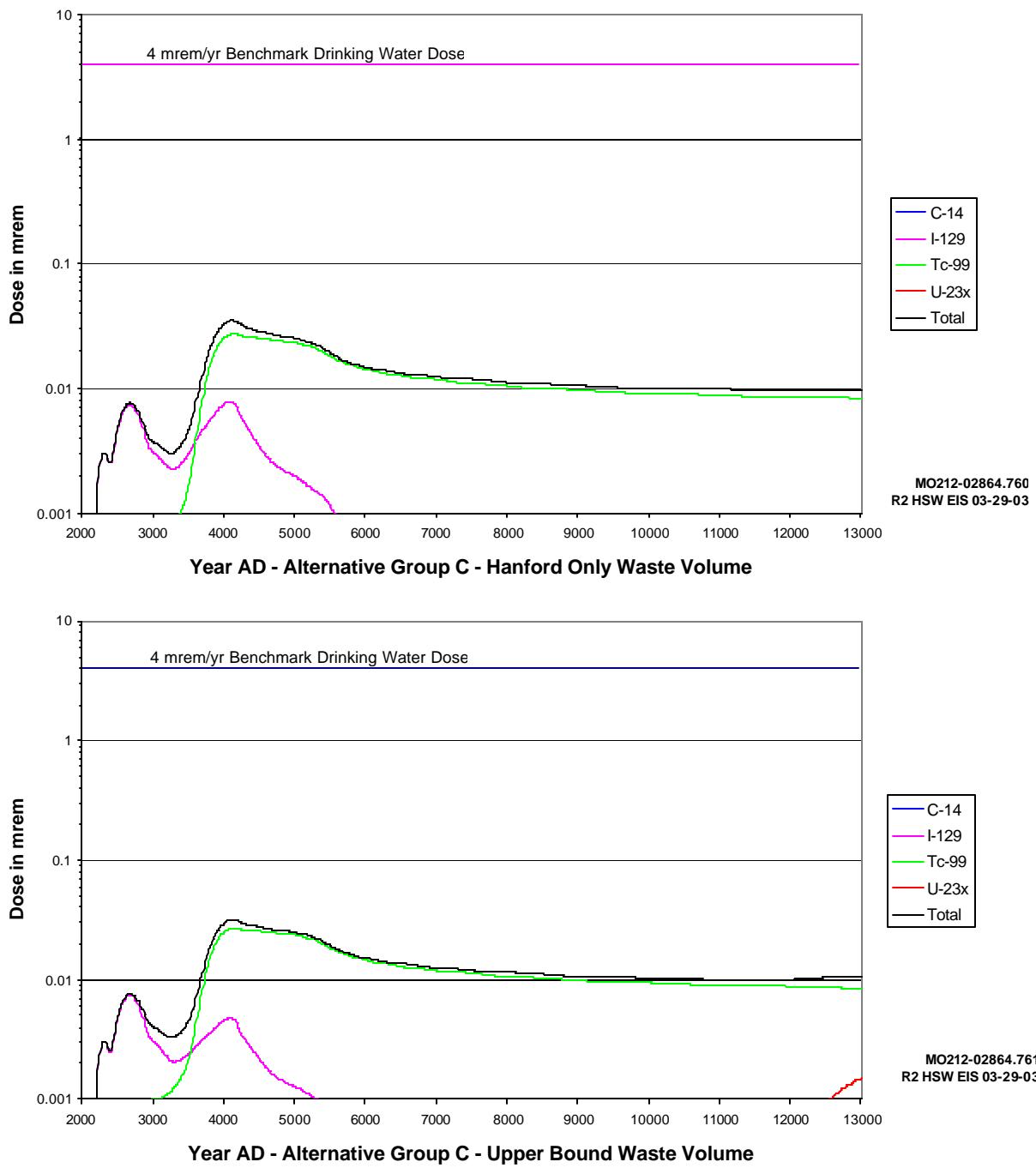
4 **Figure F.7.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well  
5 Adjacent to the Columbia River, Alternative Group B



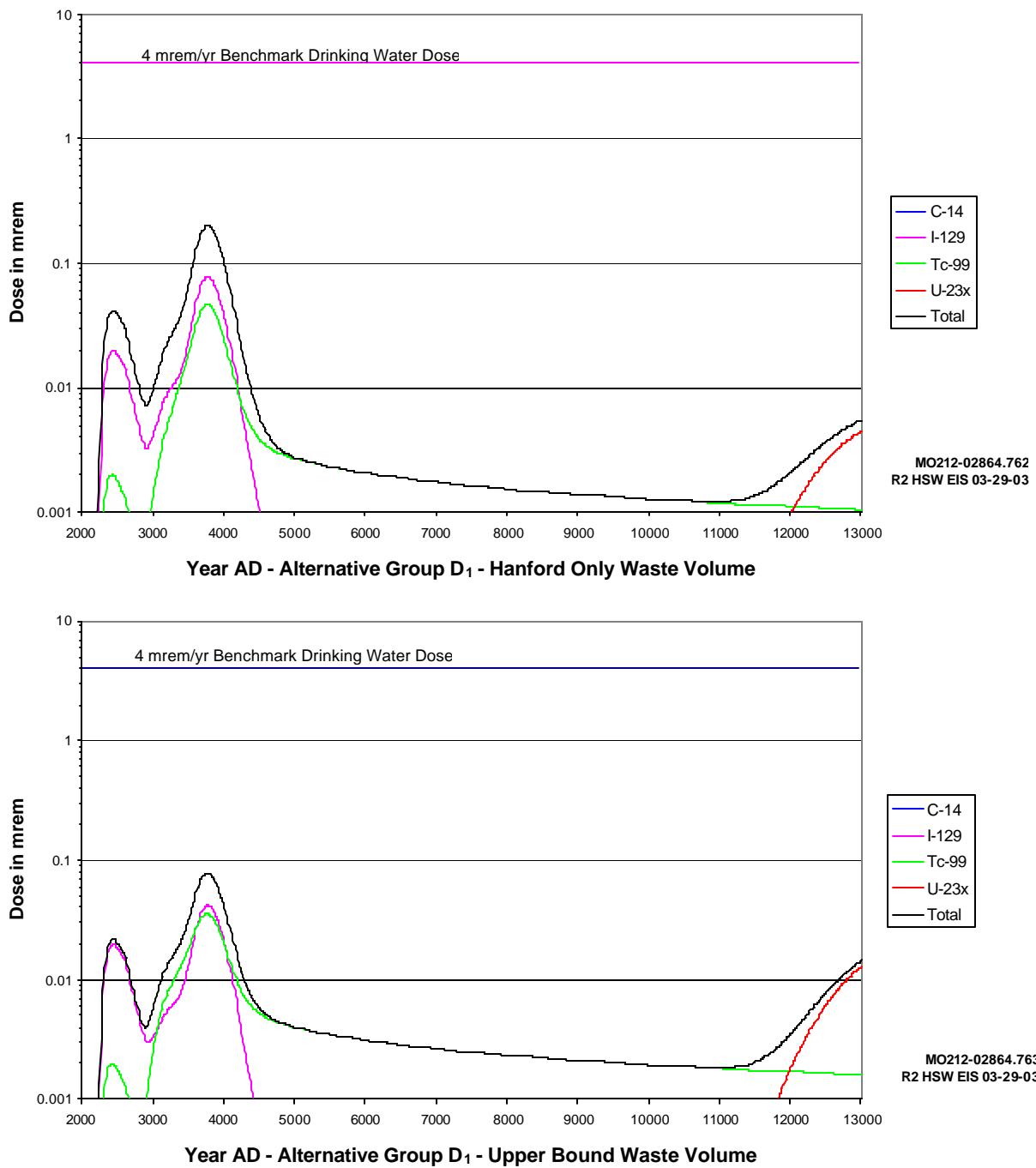


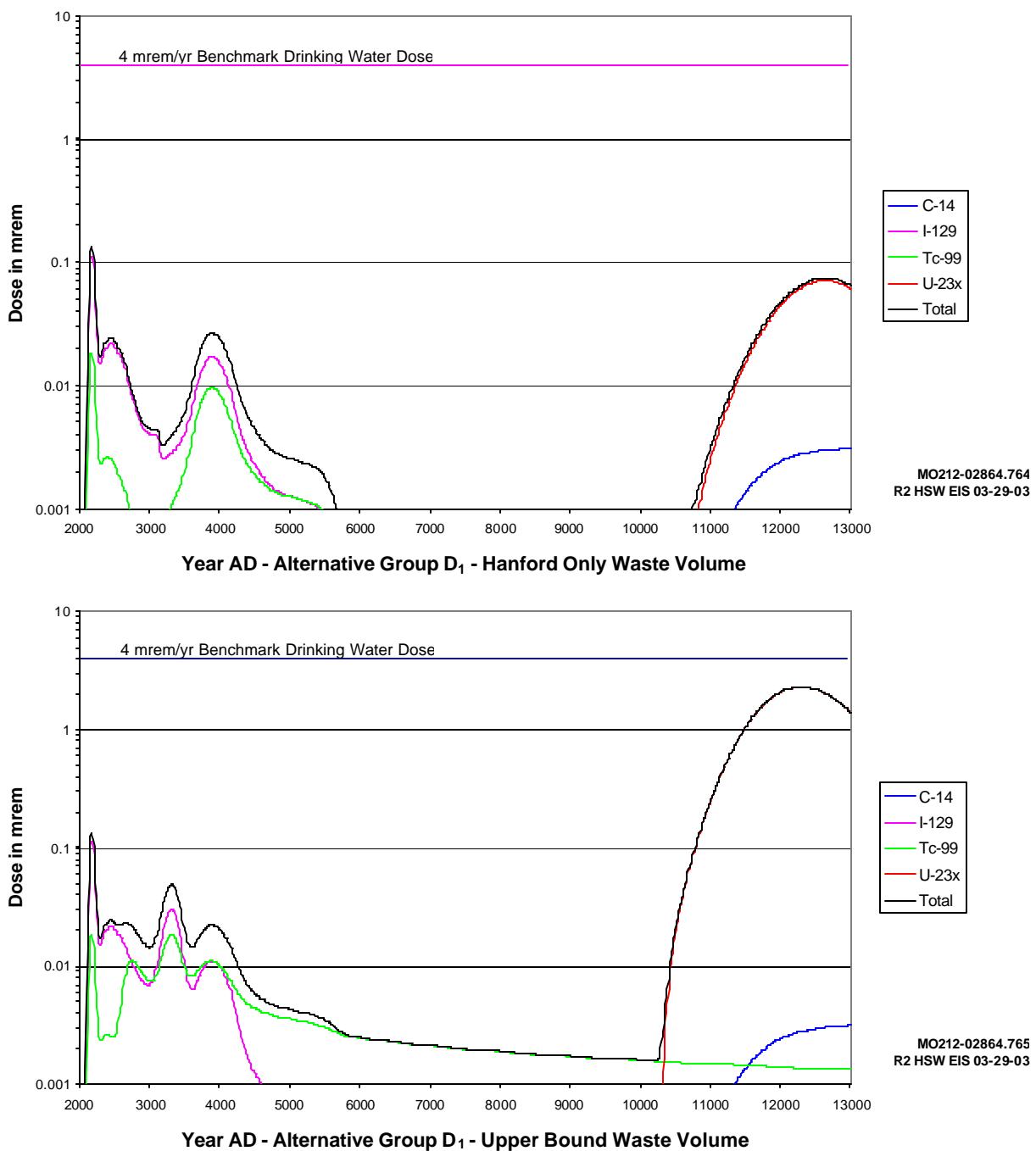
4 **Figure F.9.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well  
5 1 km Down-Gradient Northwest from 200 East Area, Alternative Group C

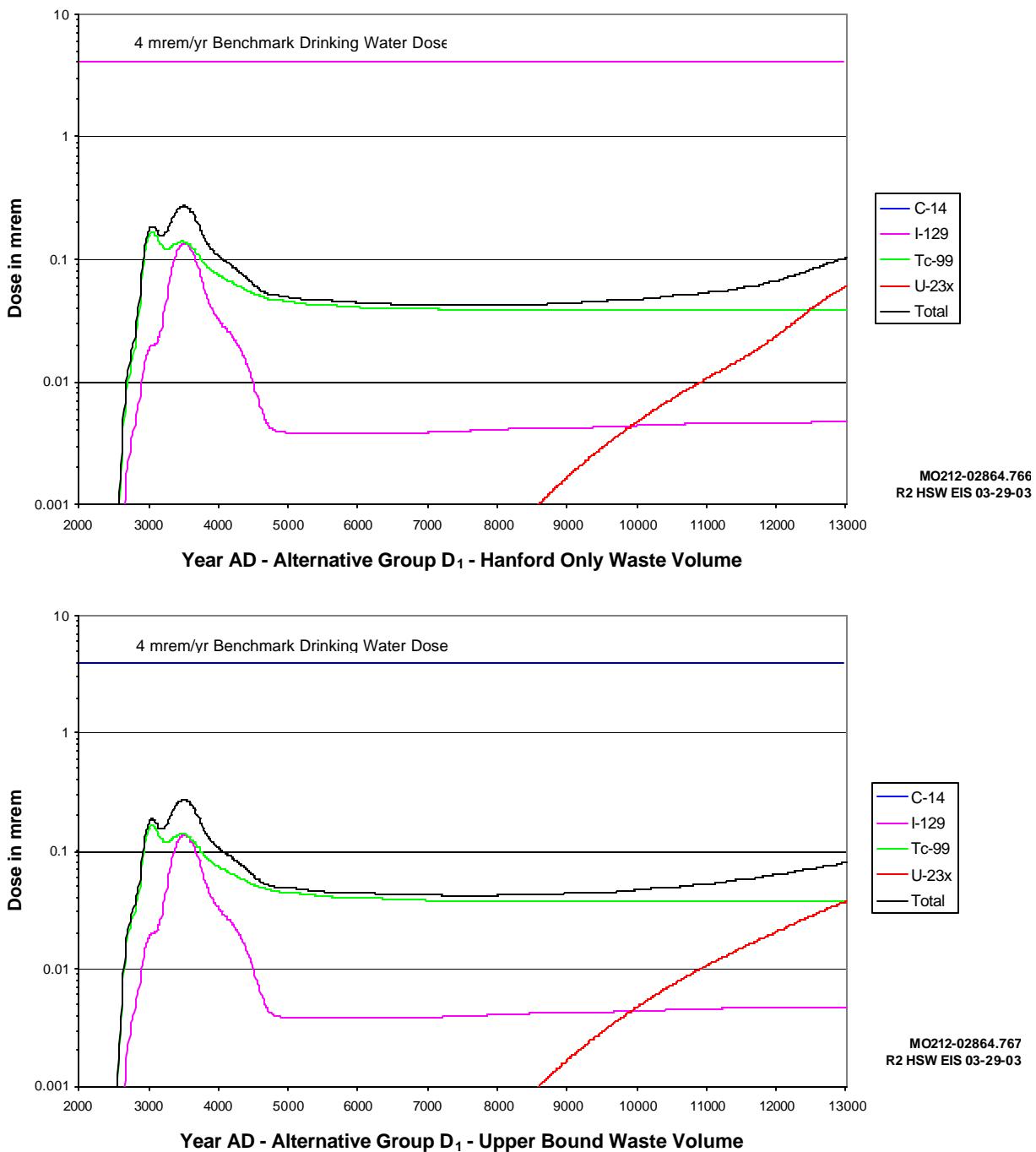


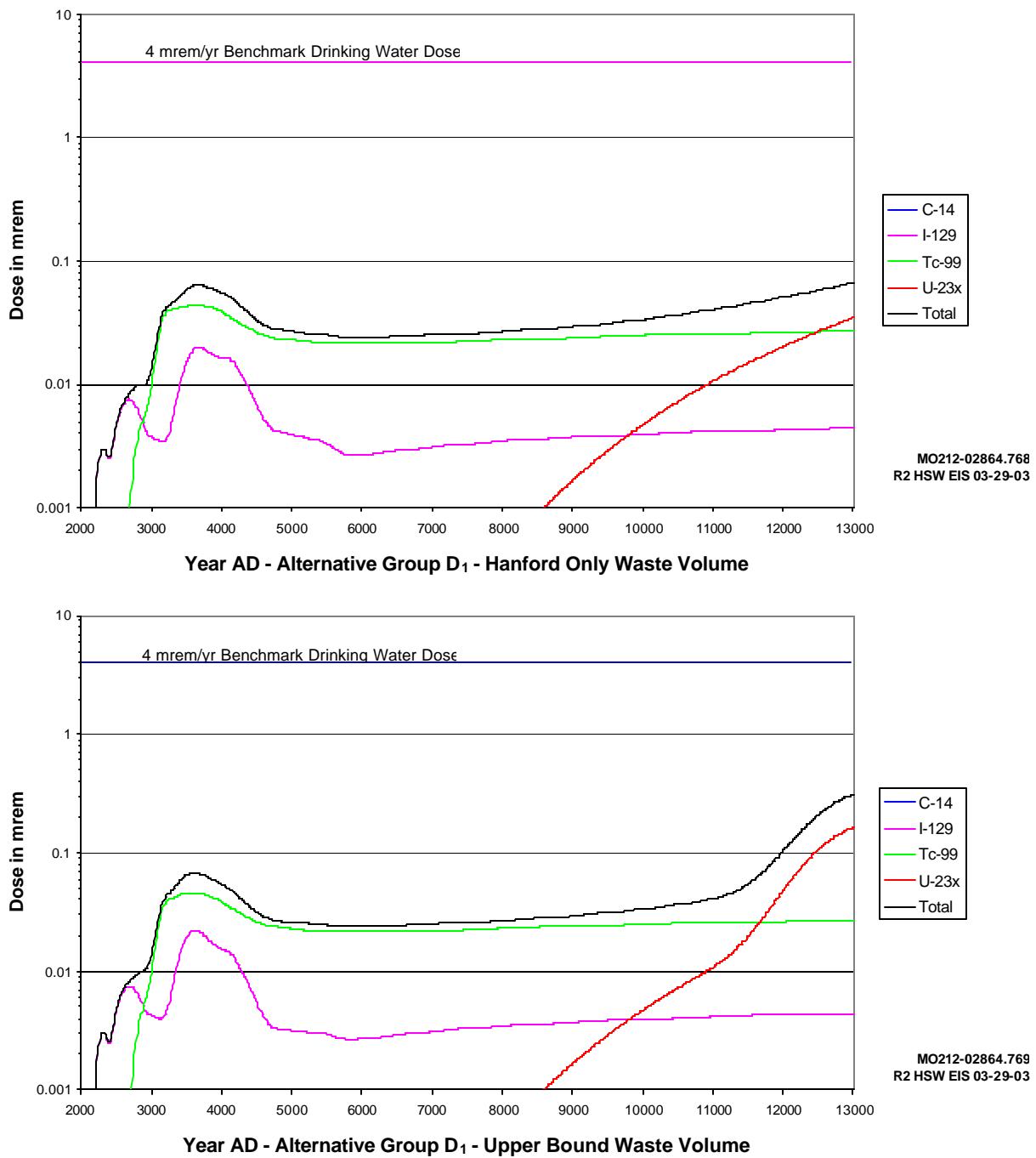


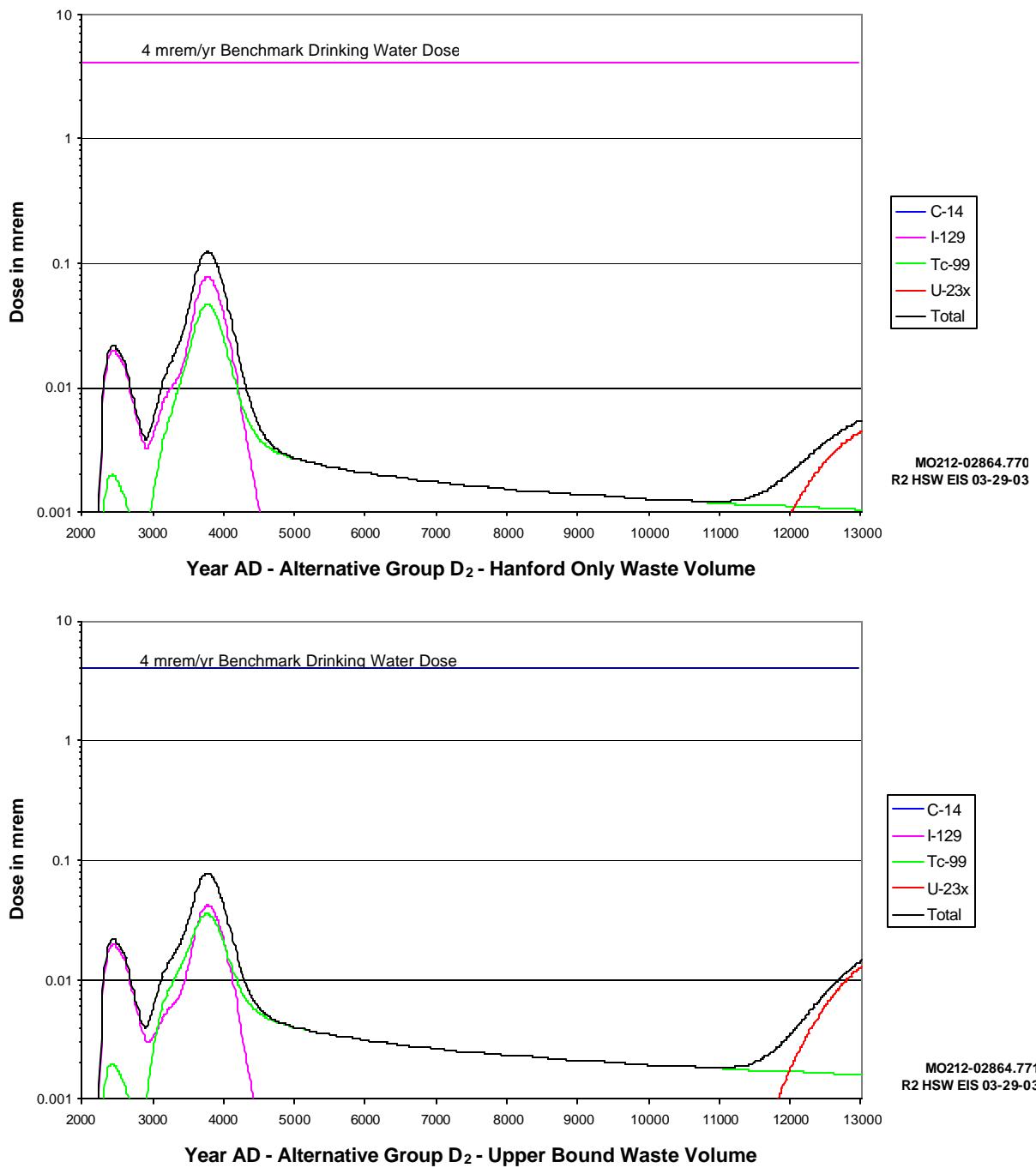
**Figure F.11.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well Adjacent to the Columbia River, Alternative Group C

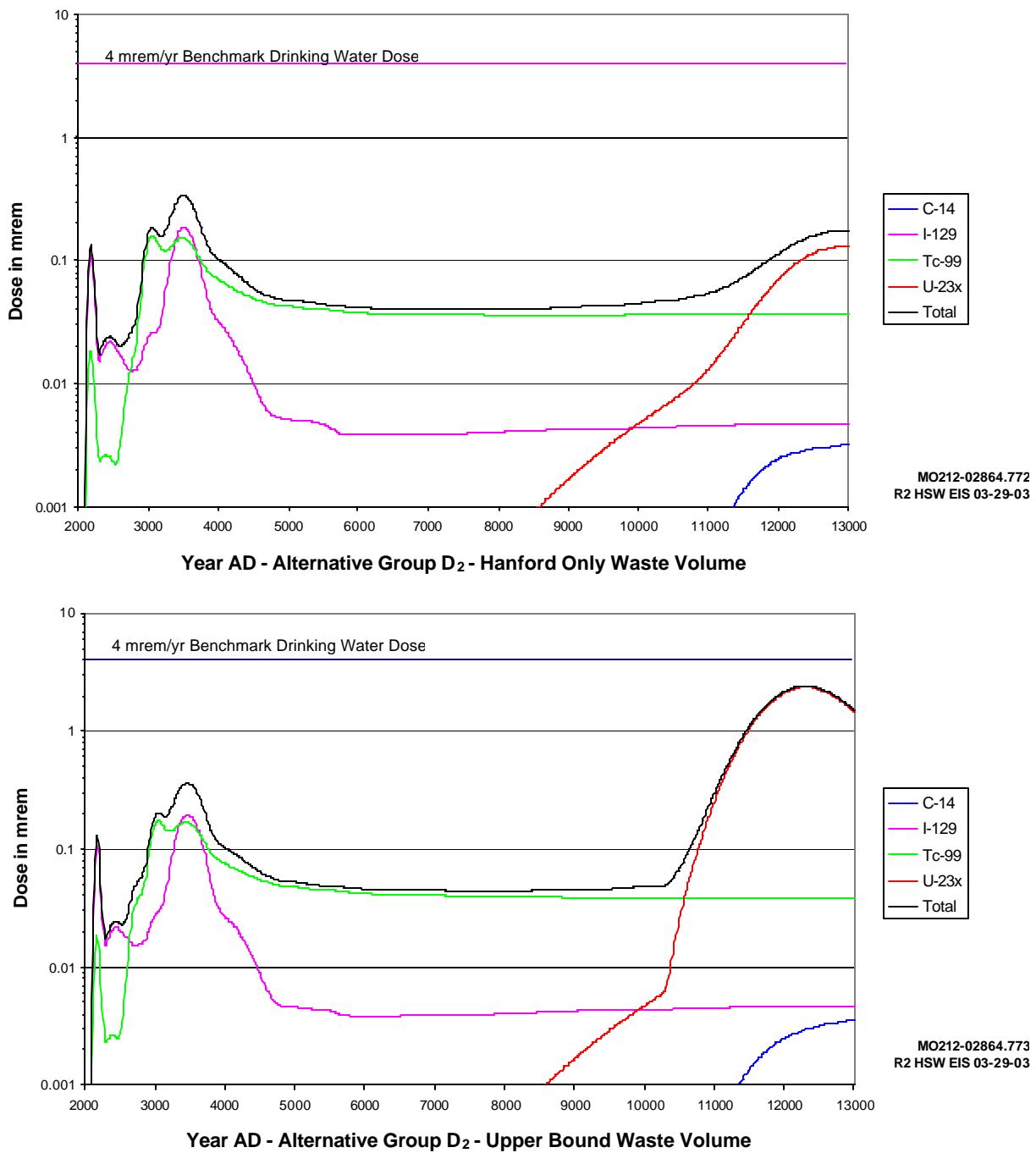


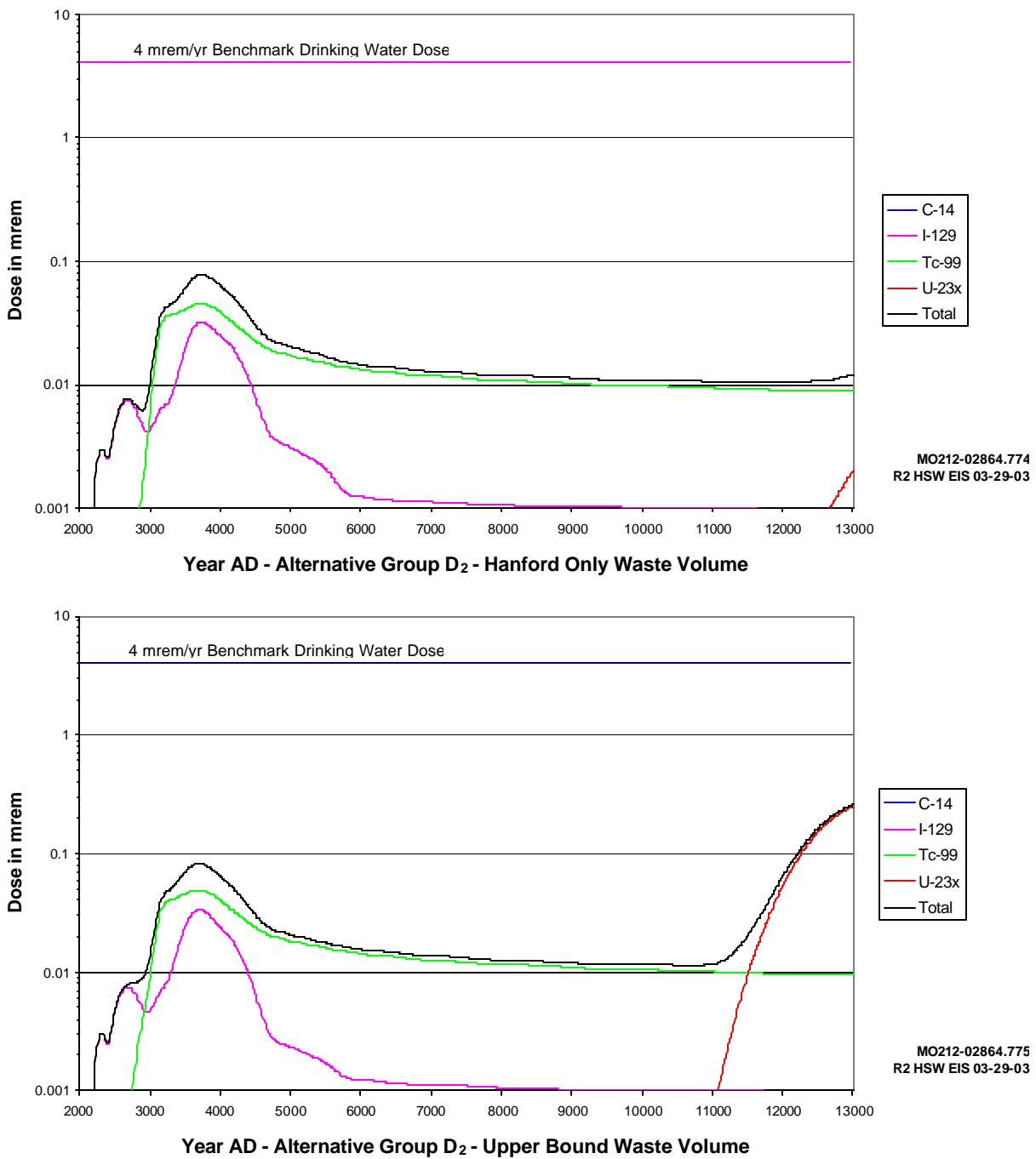


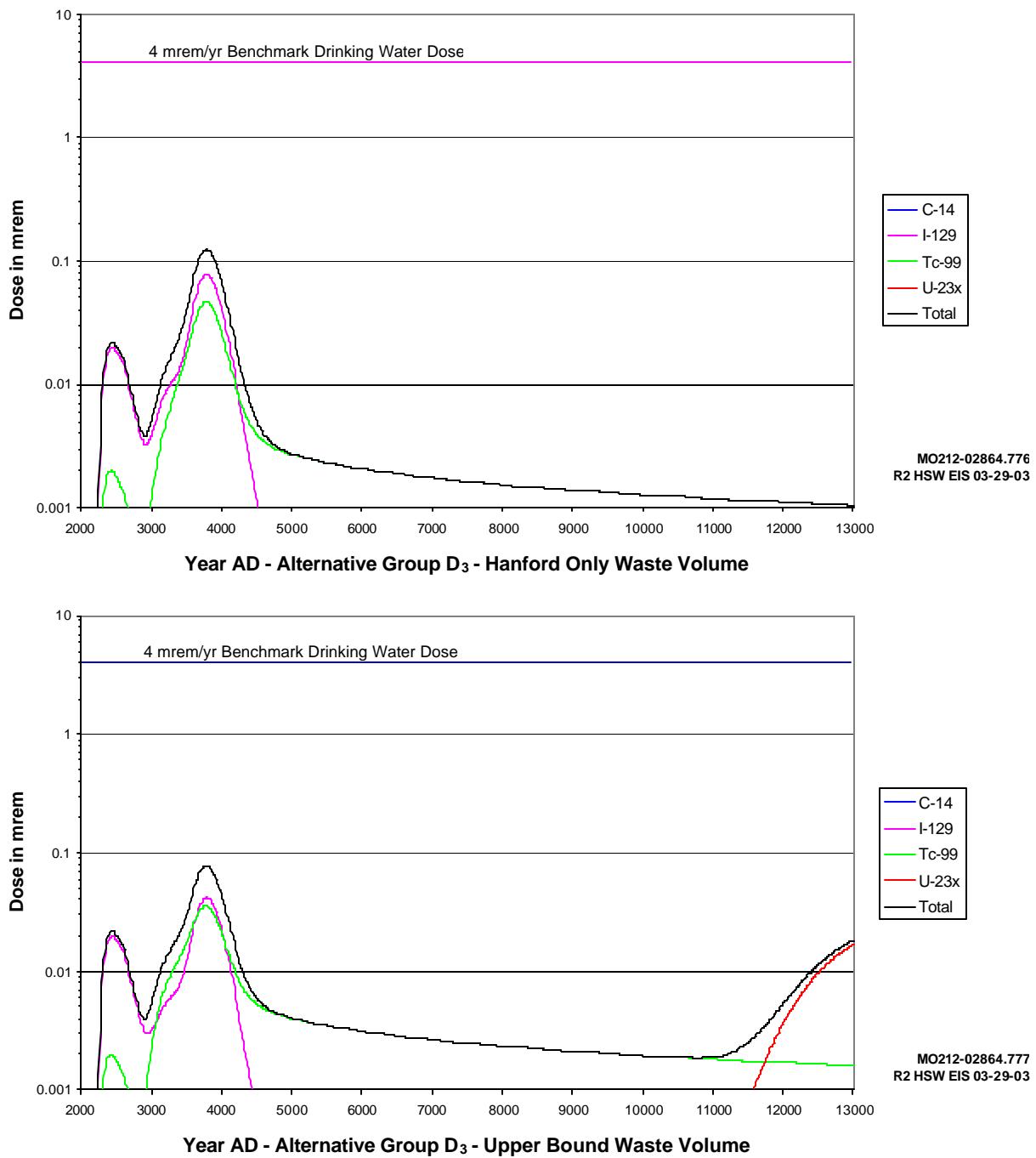


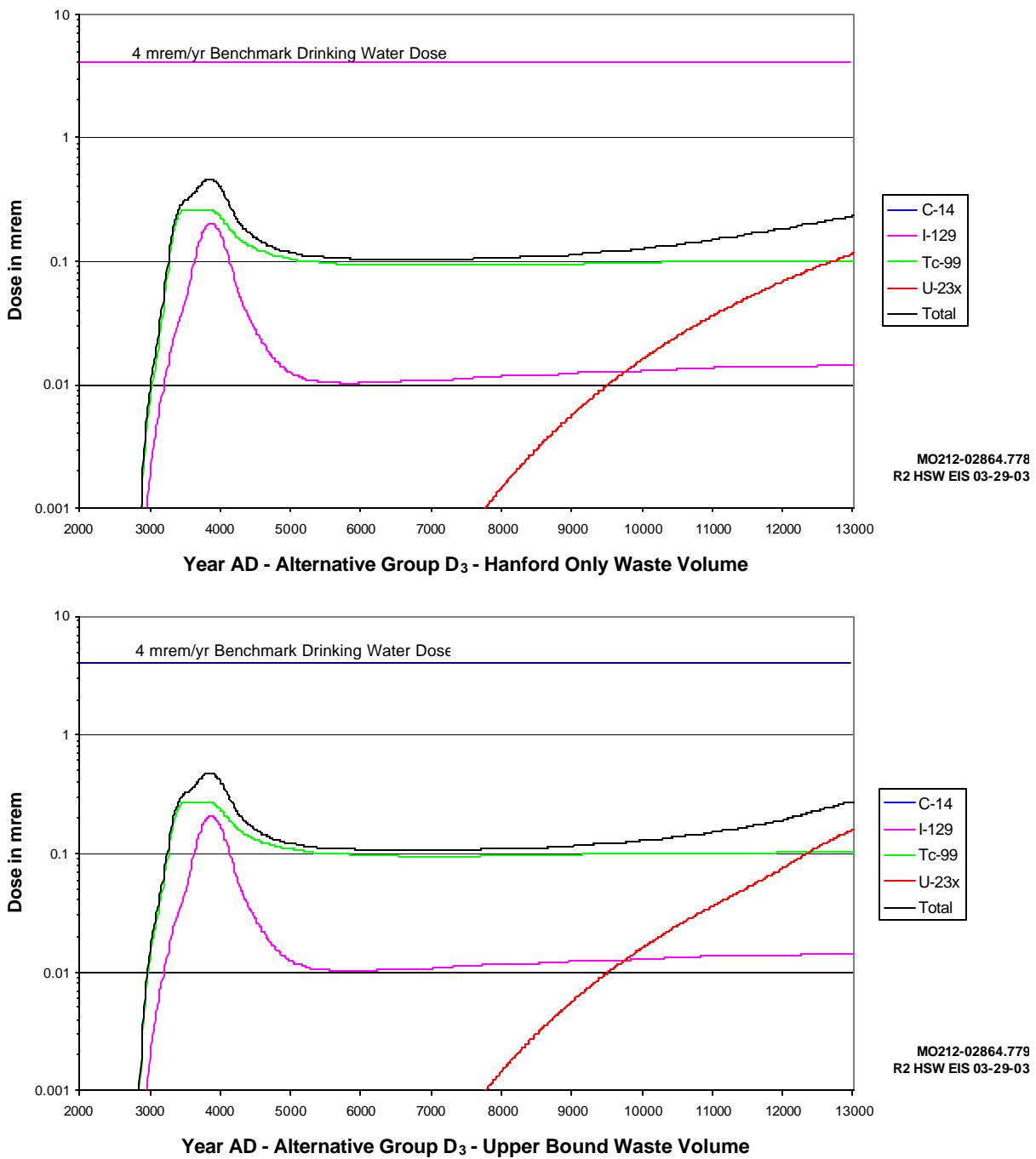


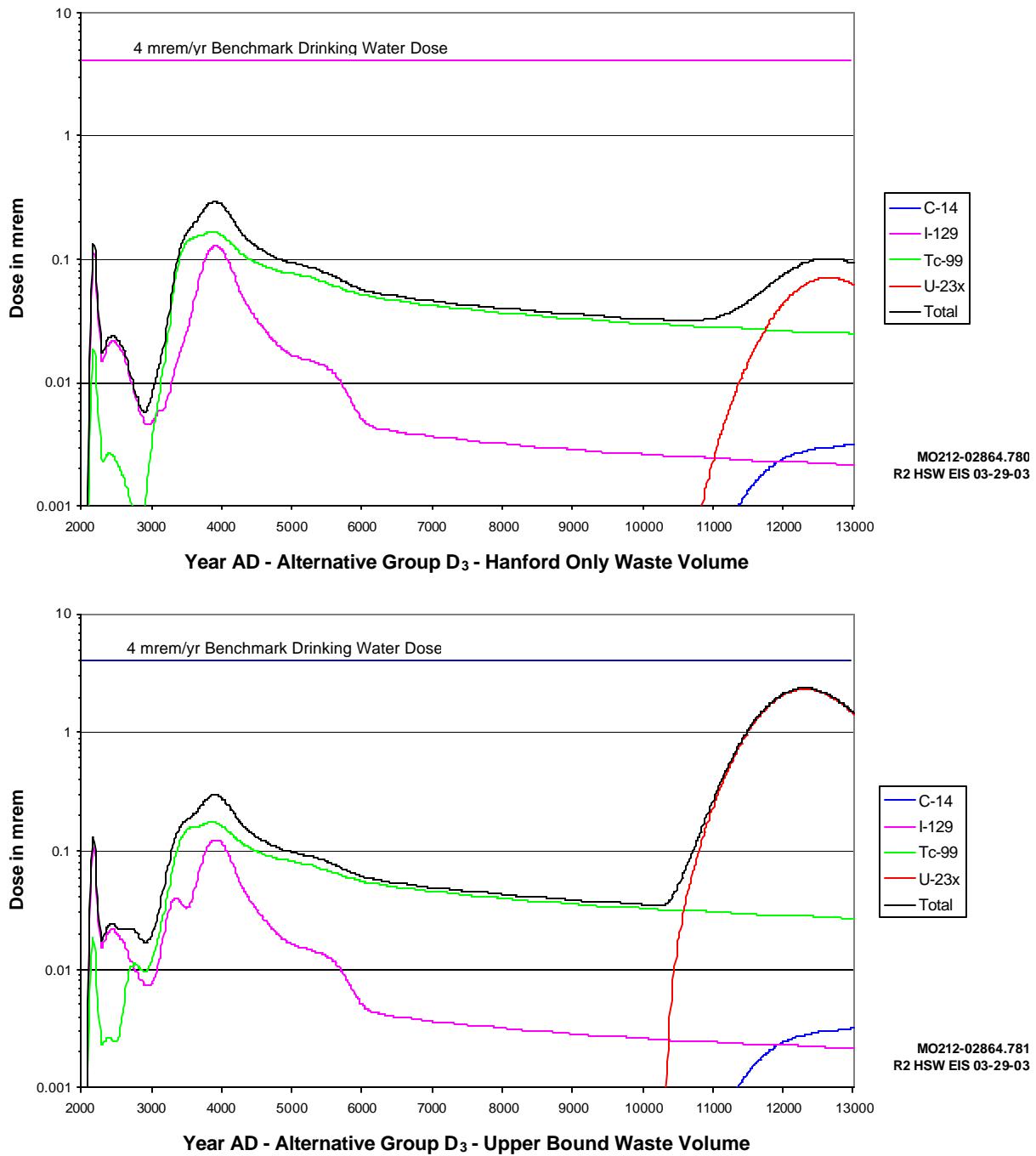


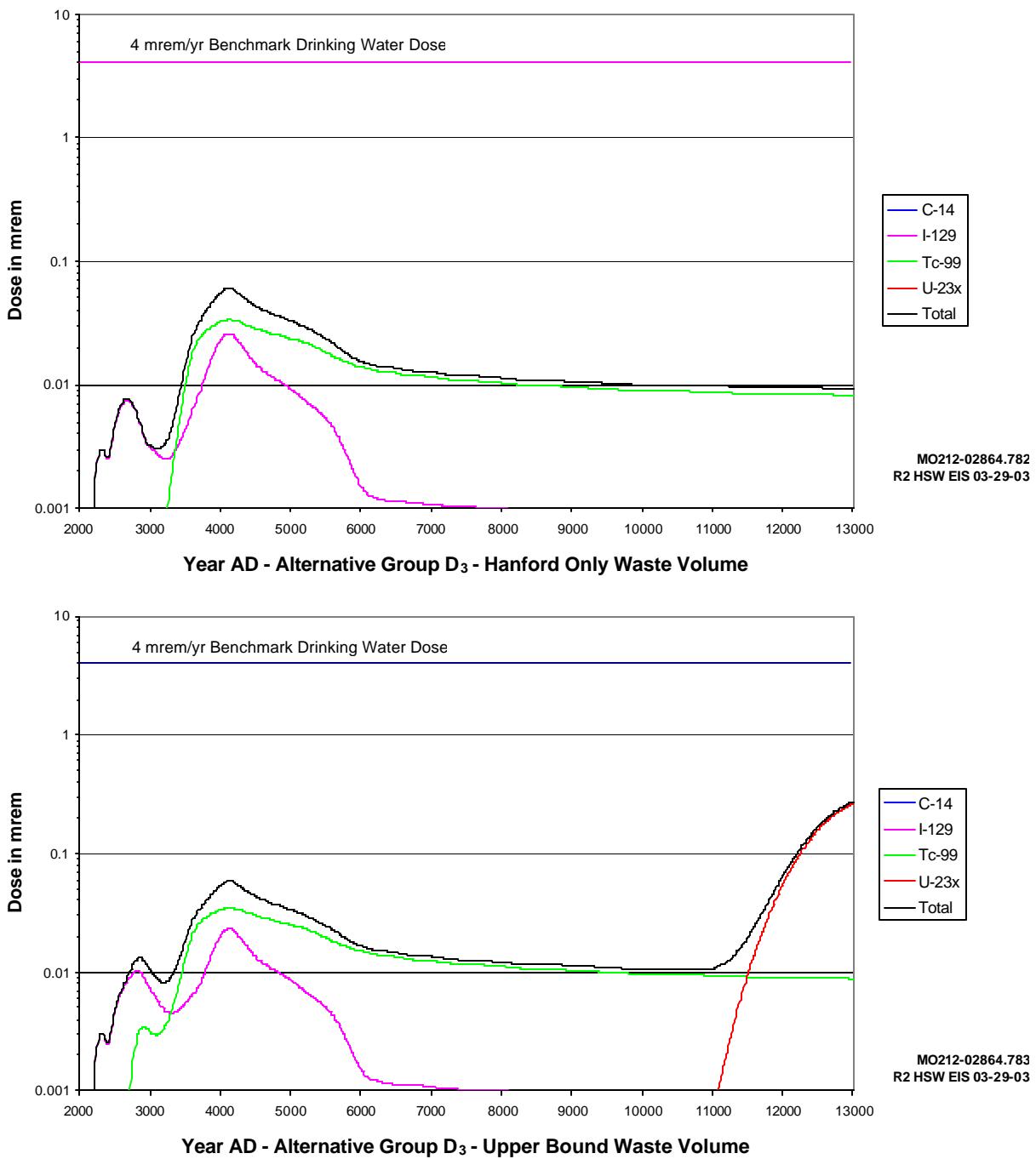


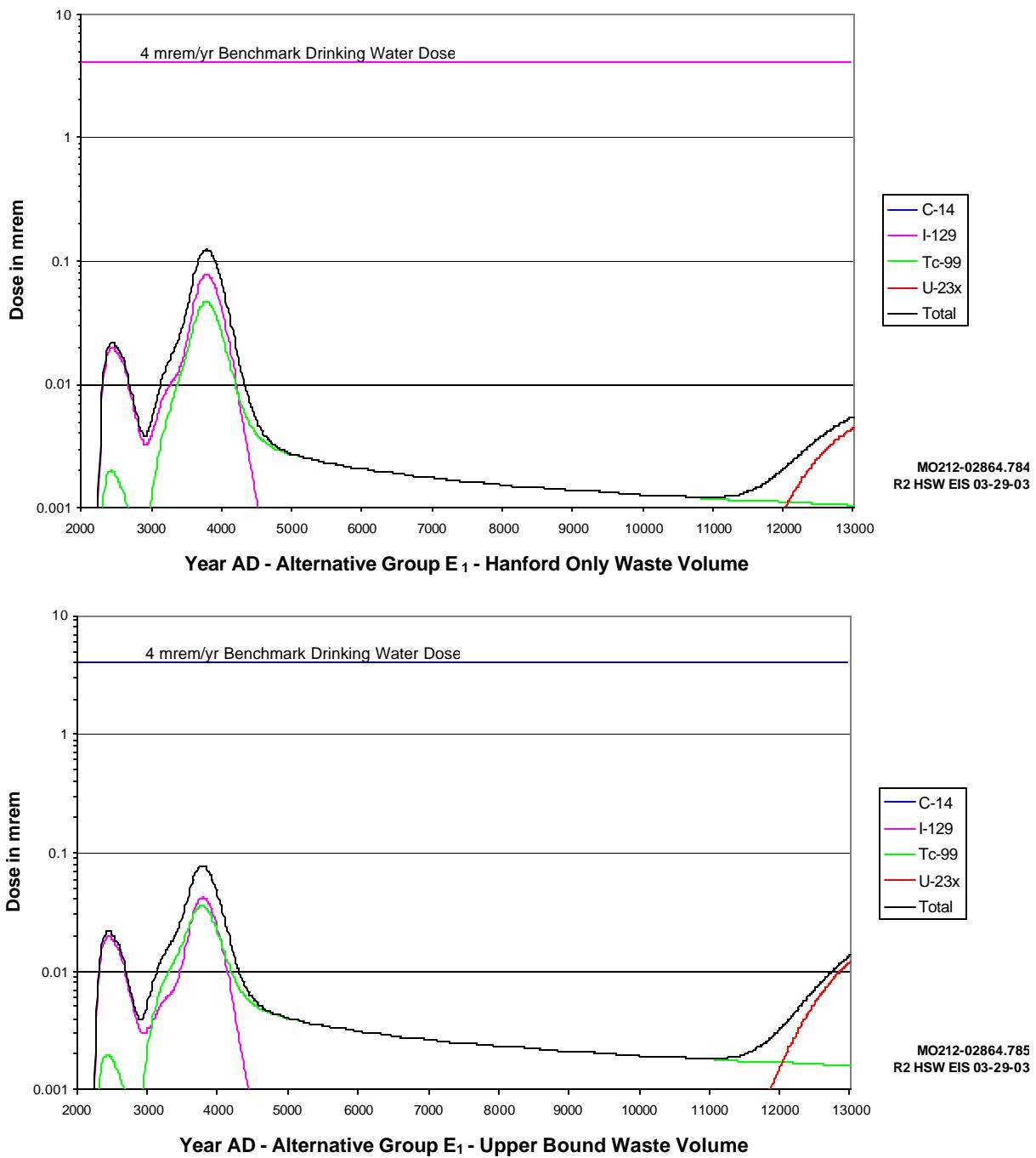


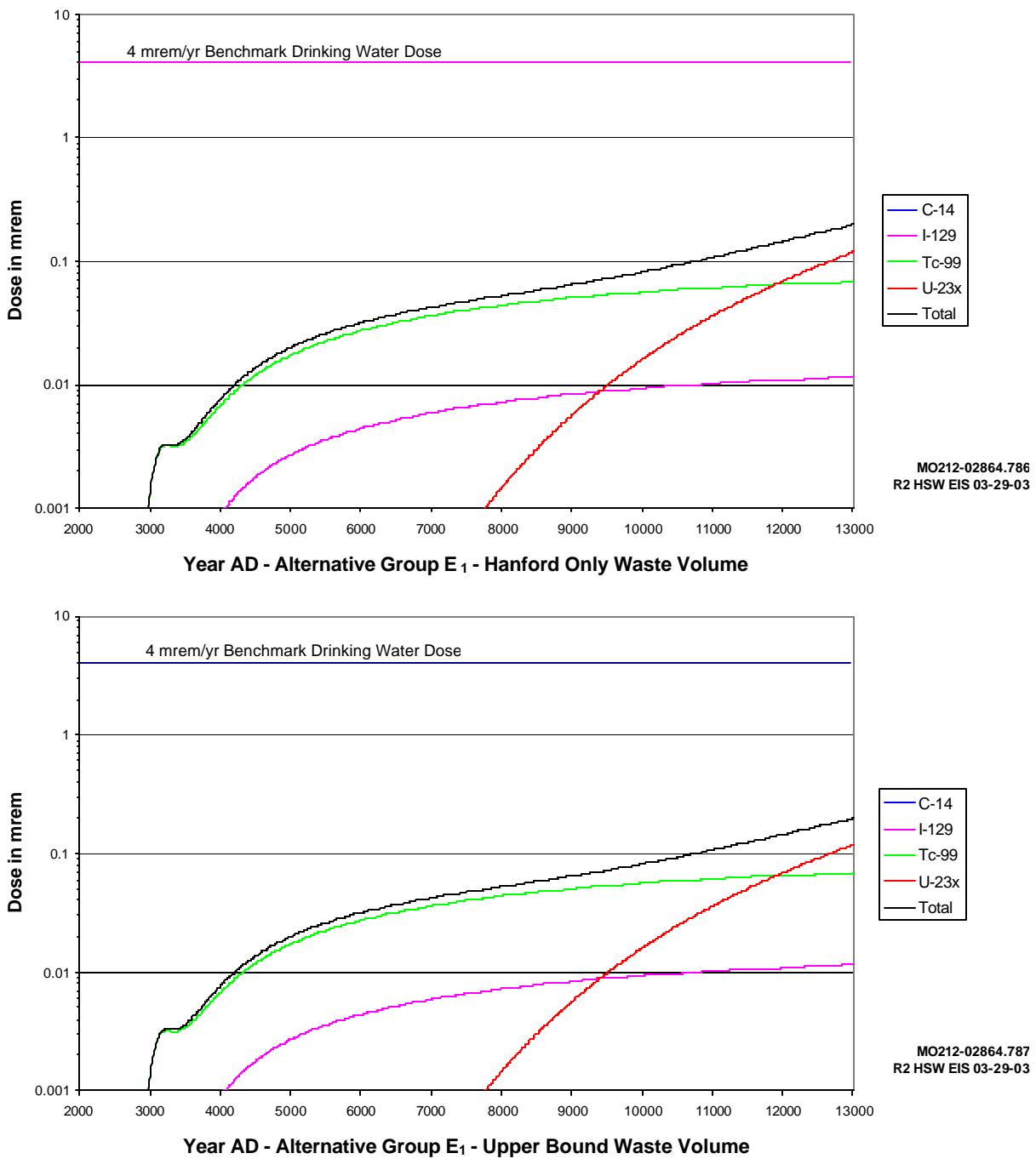


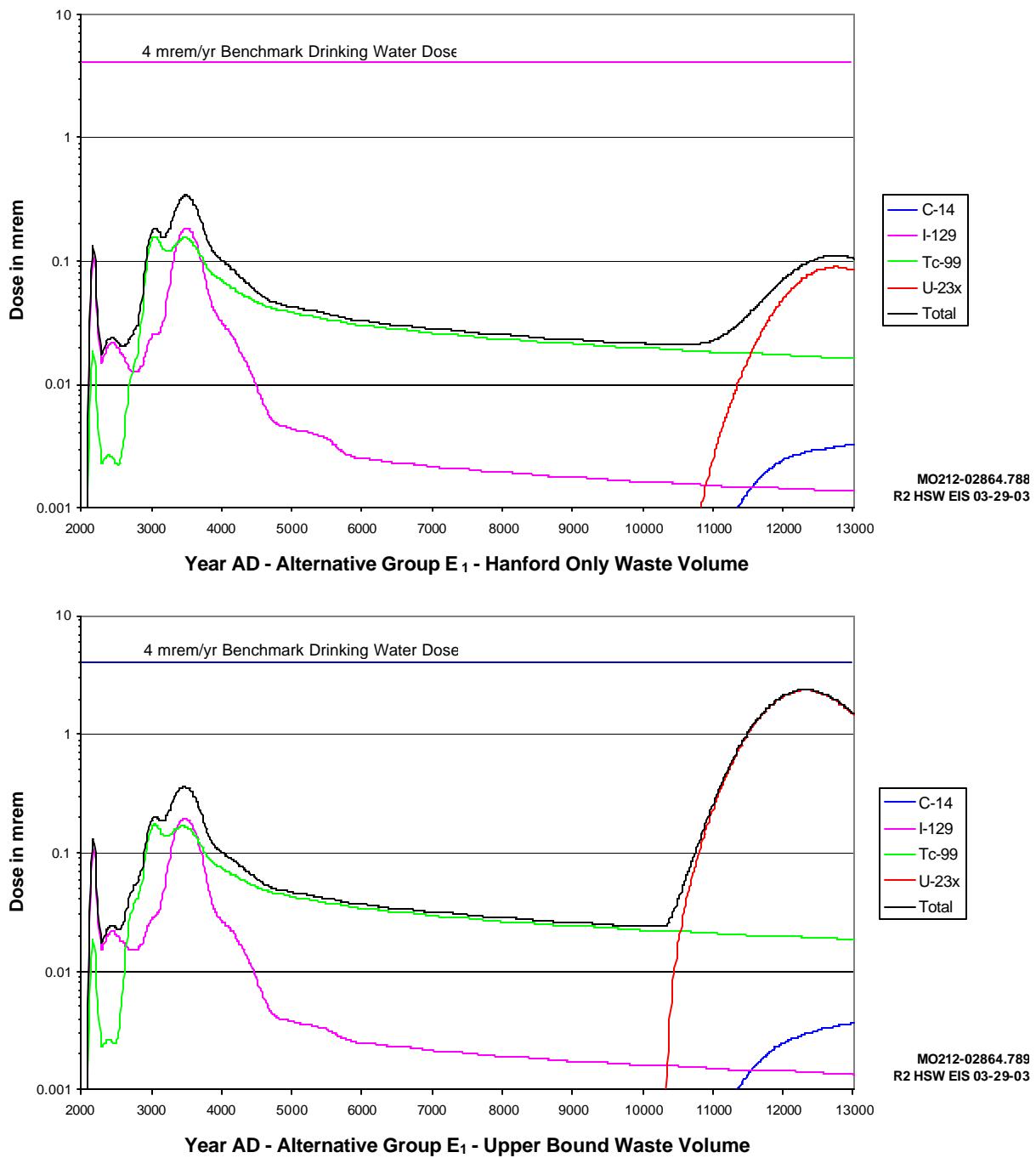




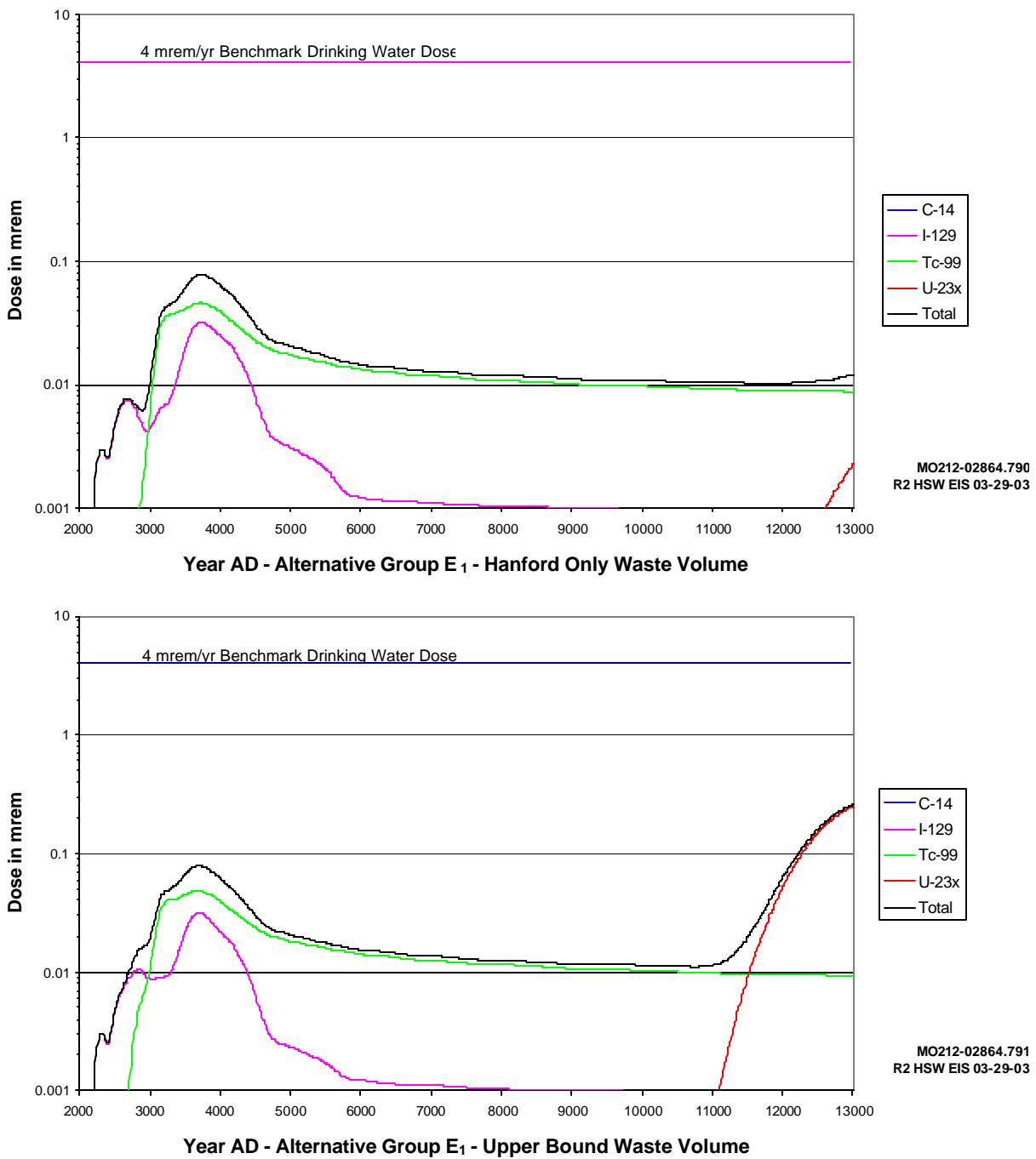


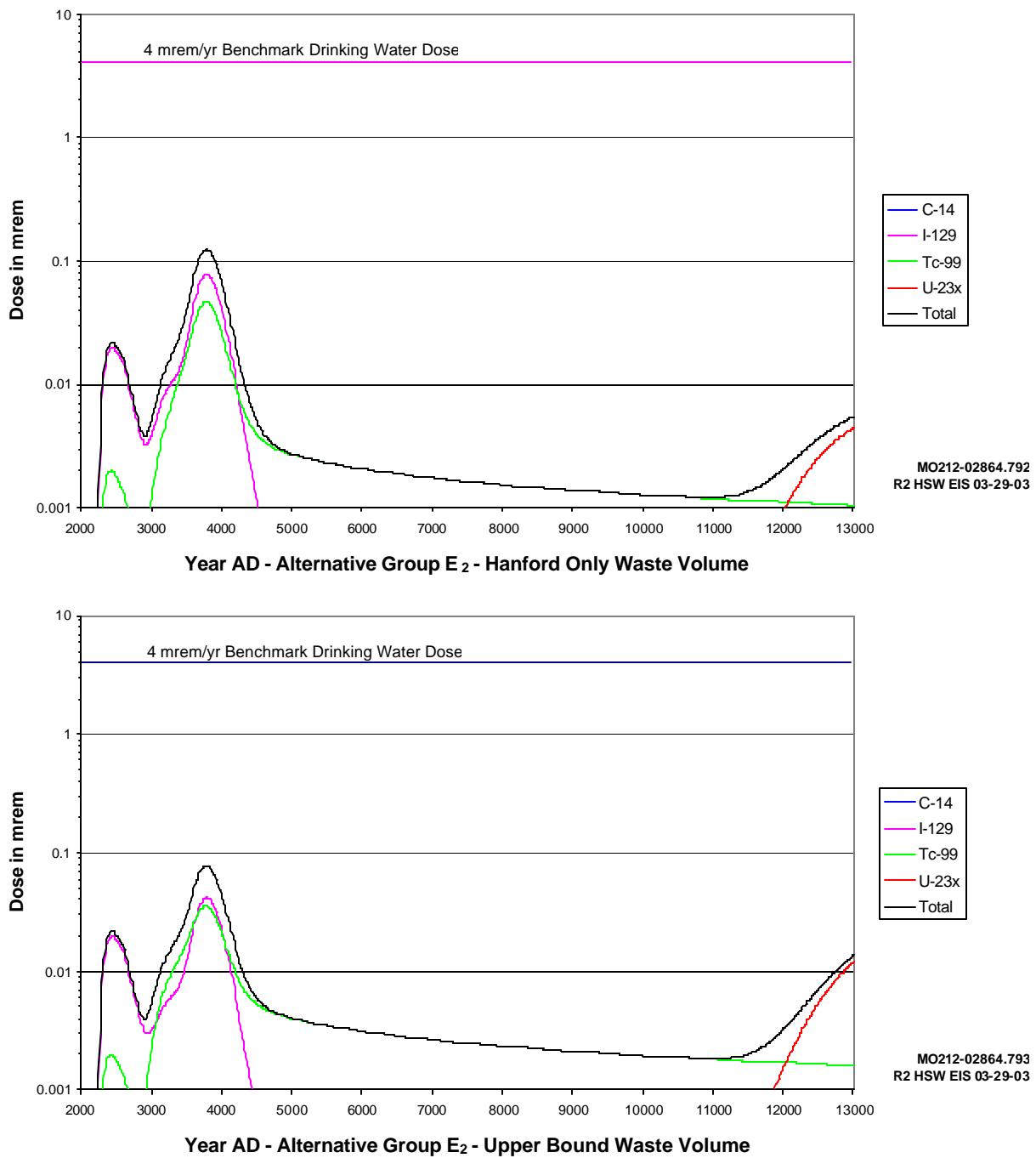


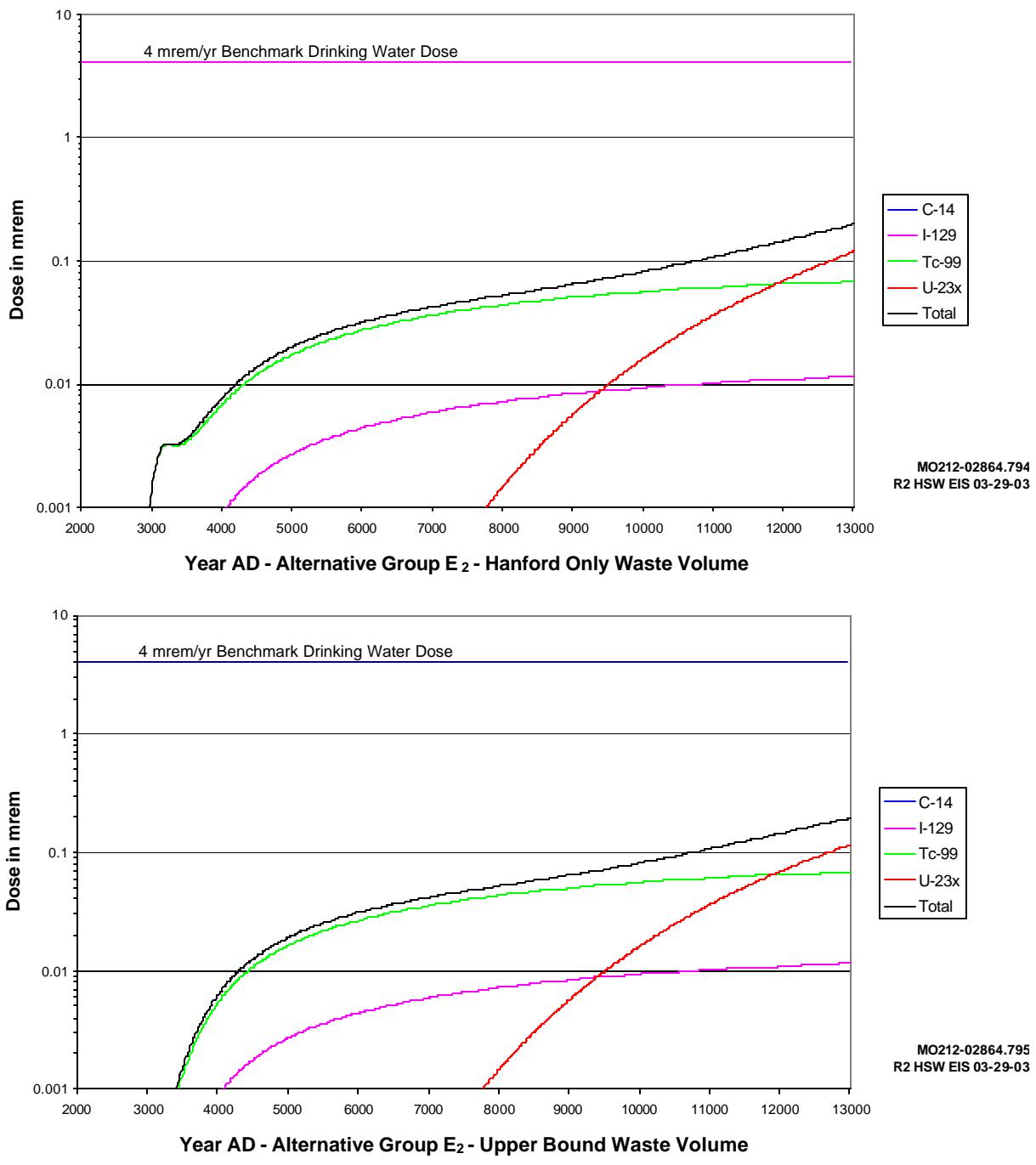


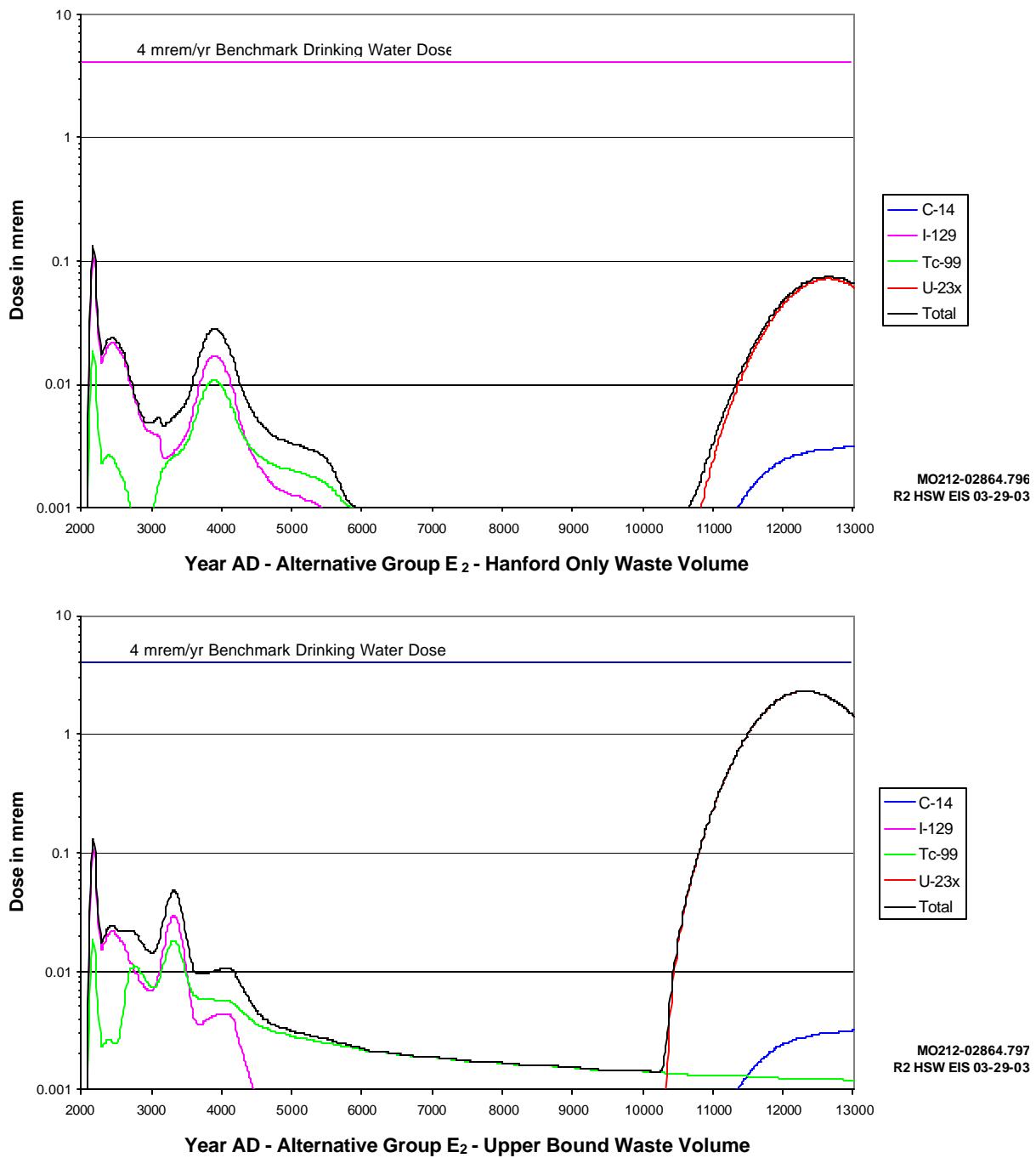


**Figure F.25.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well 1 km Down-Gradient Northwest from 200 East Area, Alternative Group E<sub>1</sub>

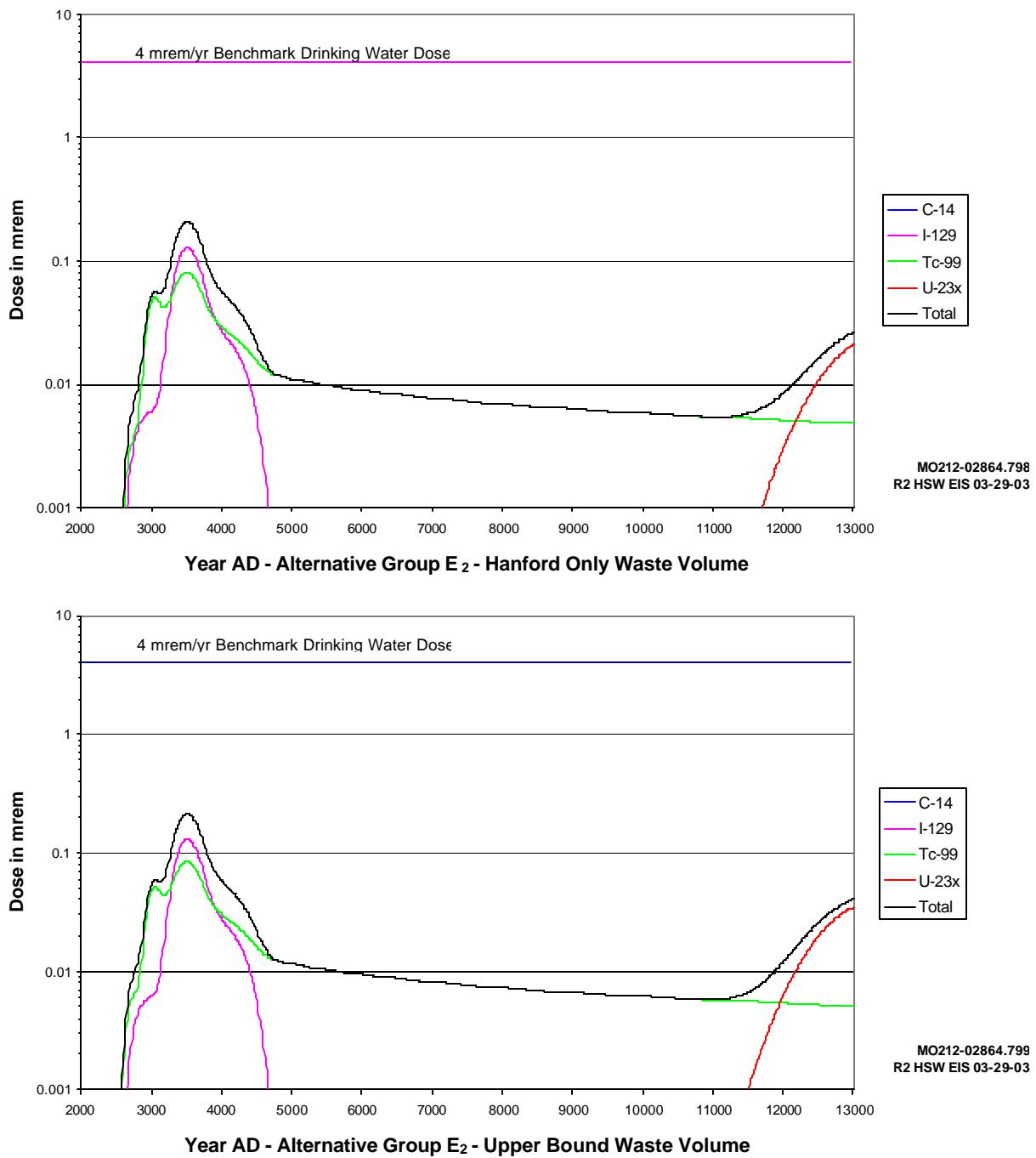


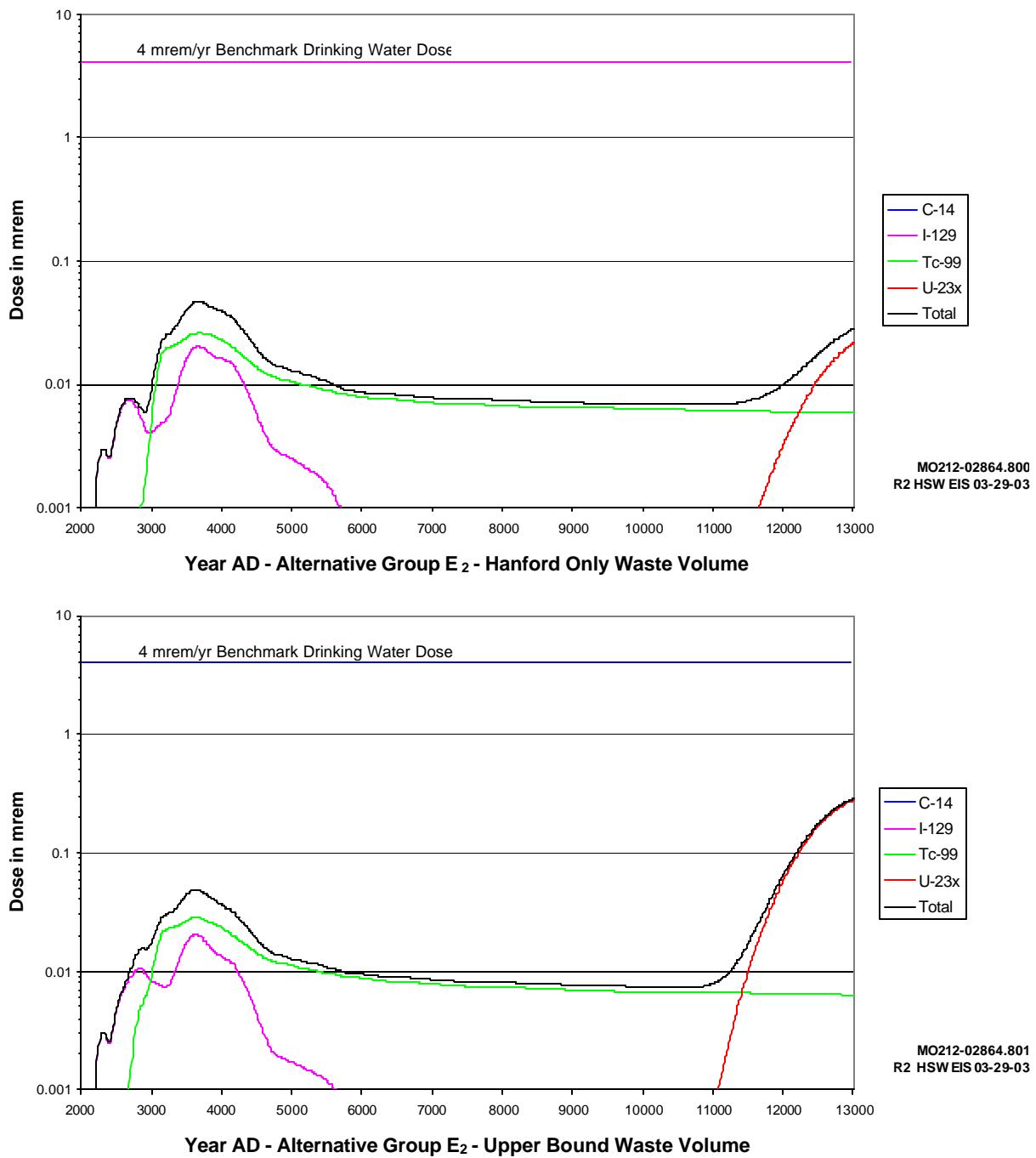


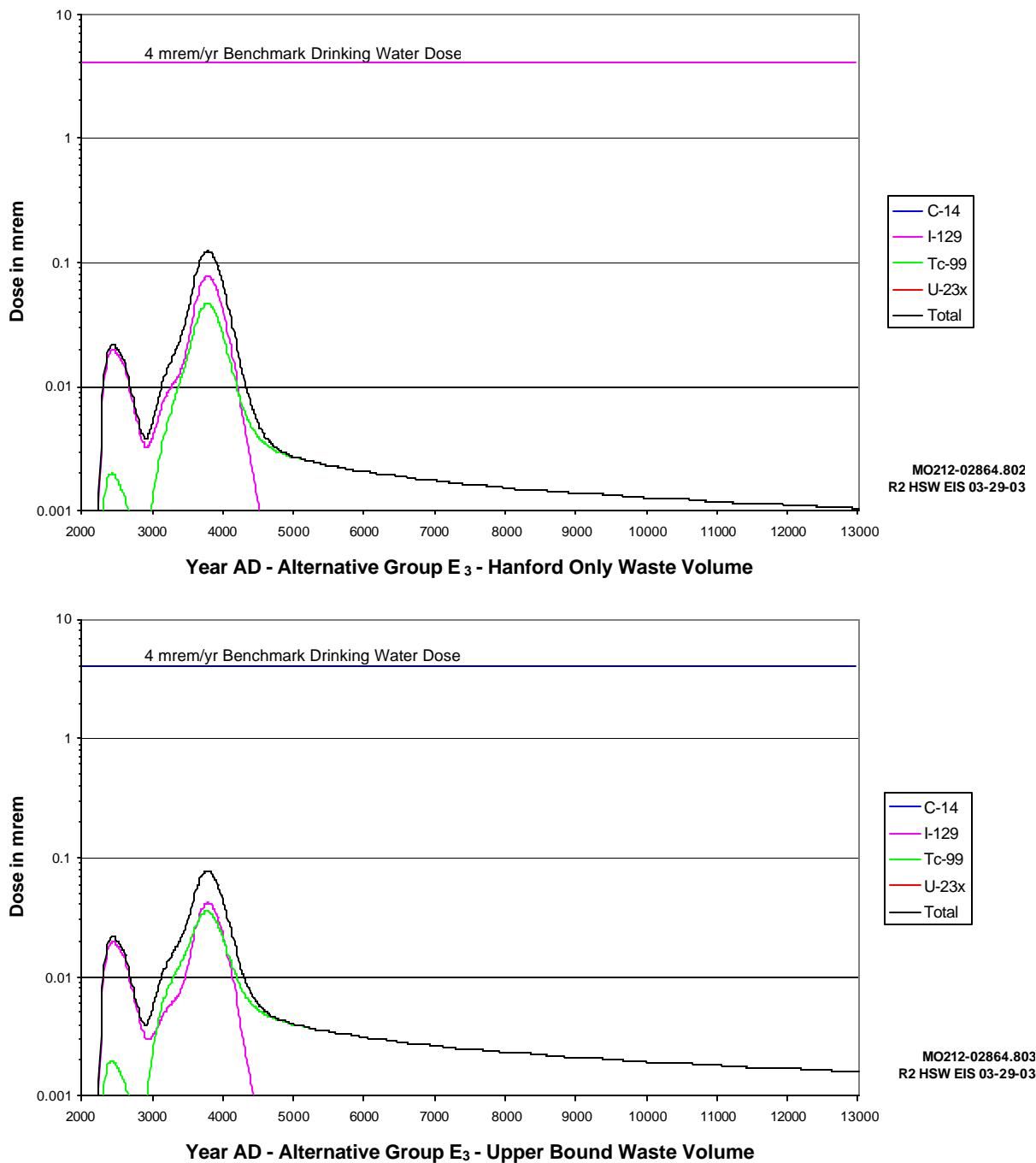


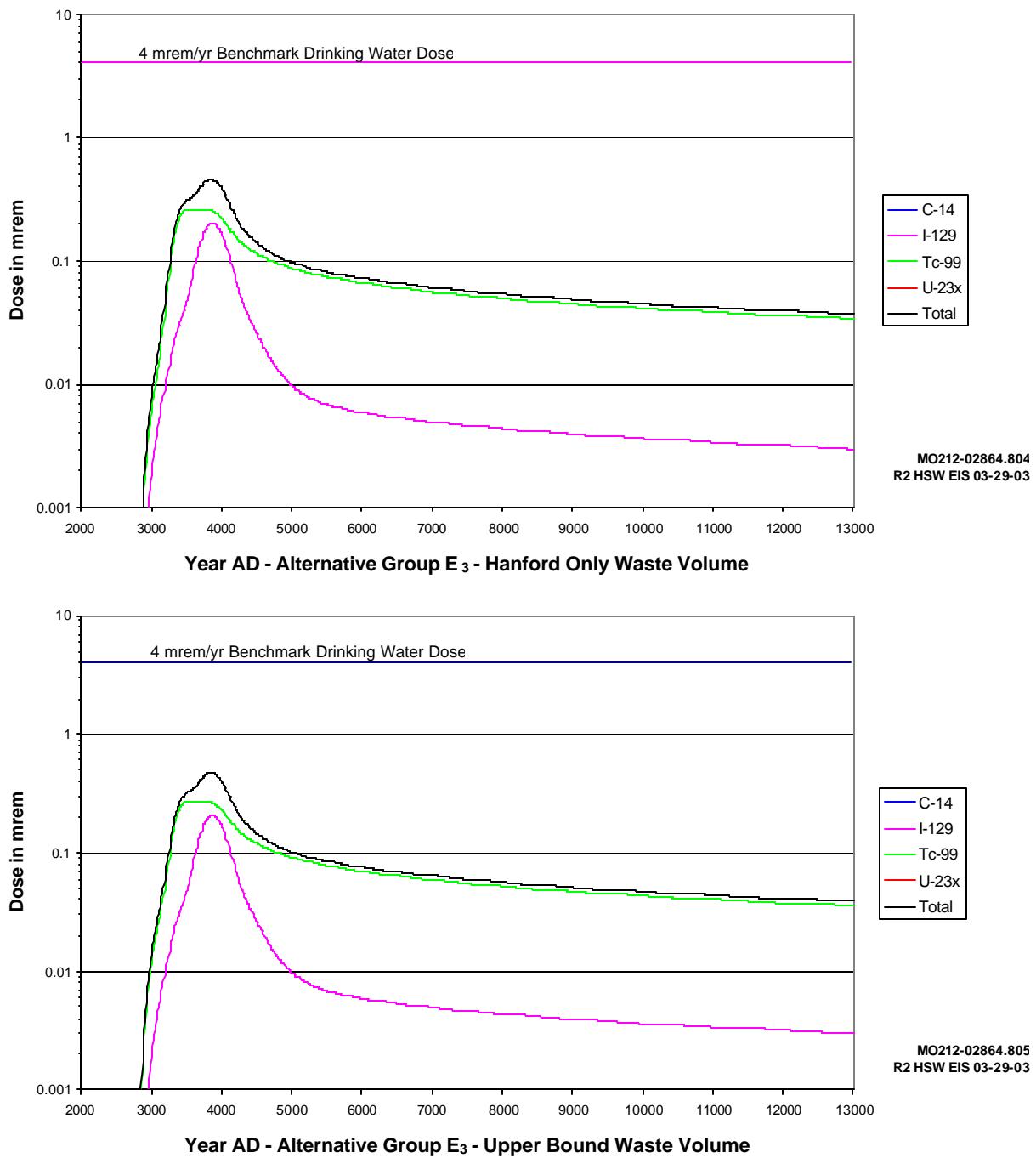


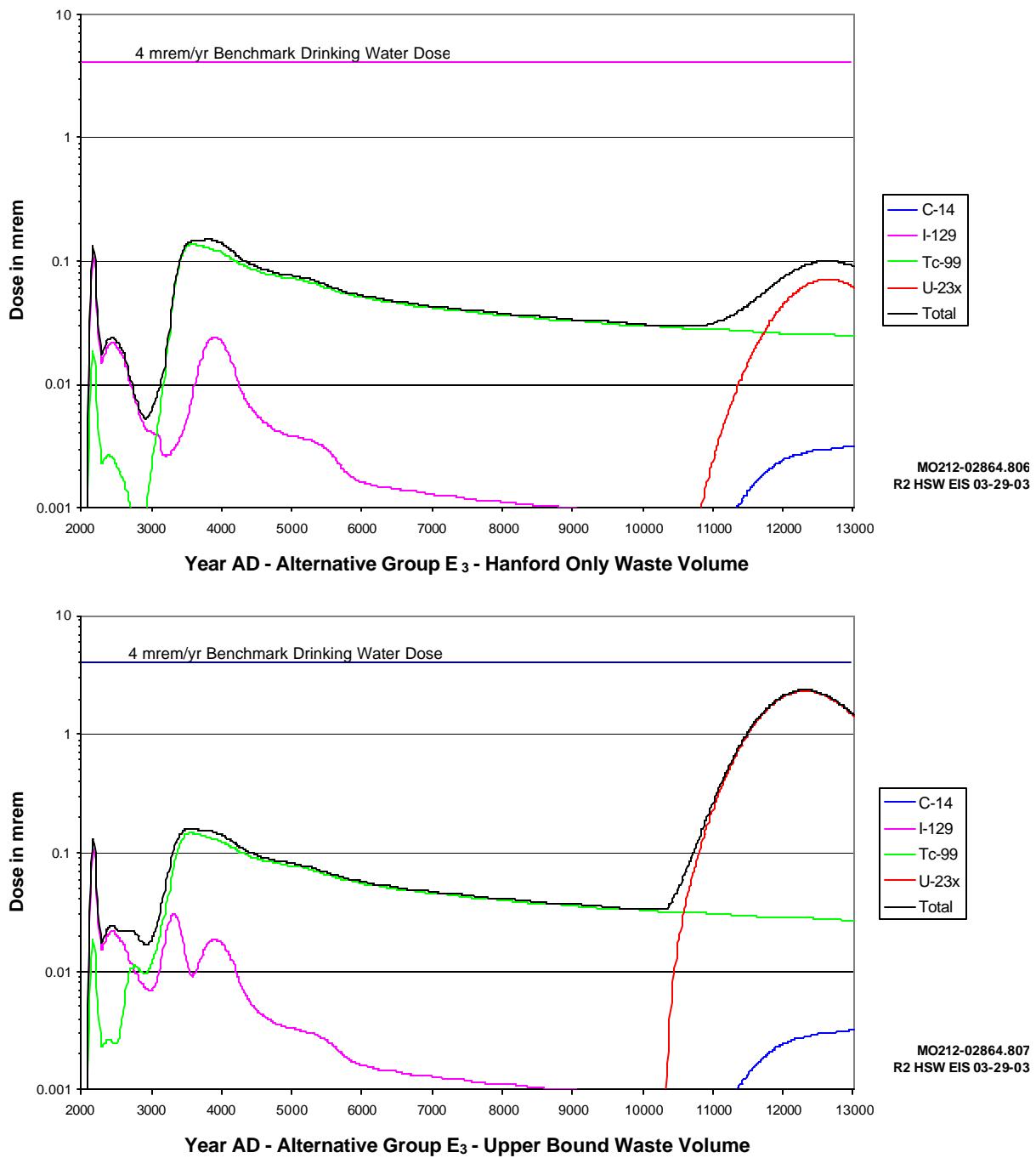
**Figure F.29.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well 1 km Down-Gradient Northwest from 200 East Area, Alternative Group E<sub>2</sub>

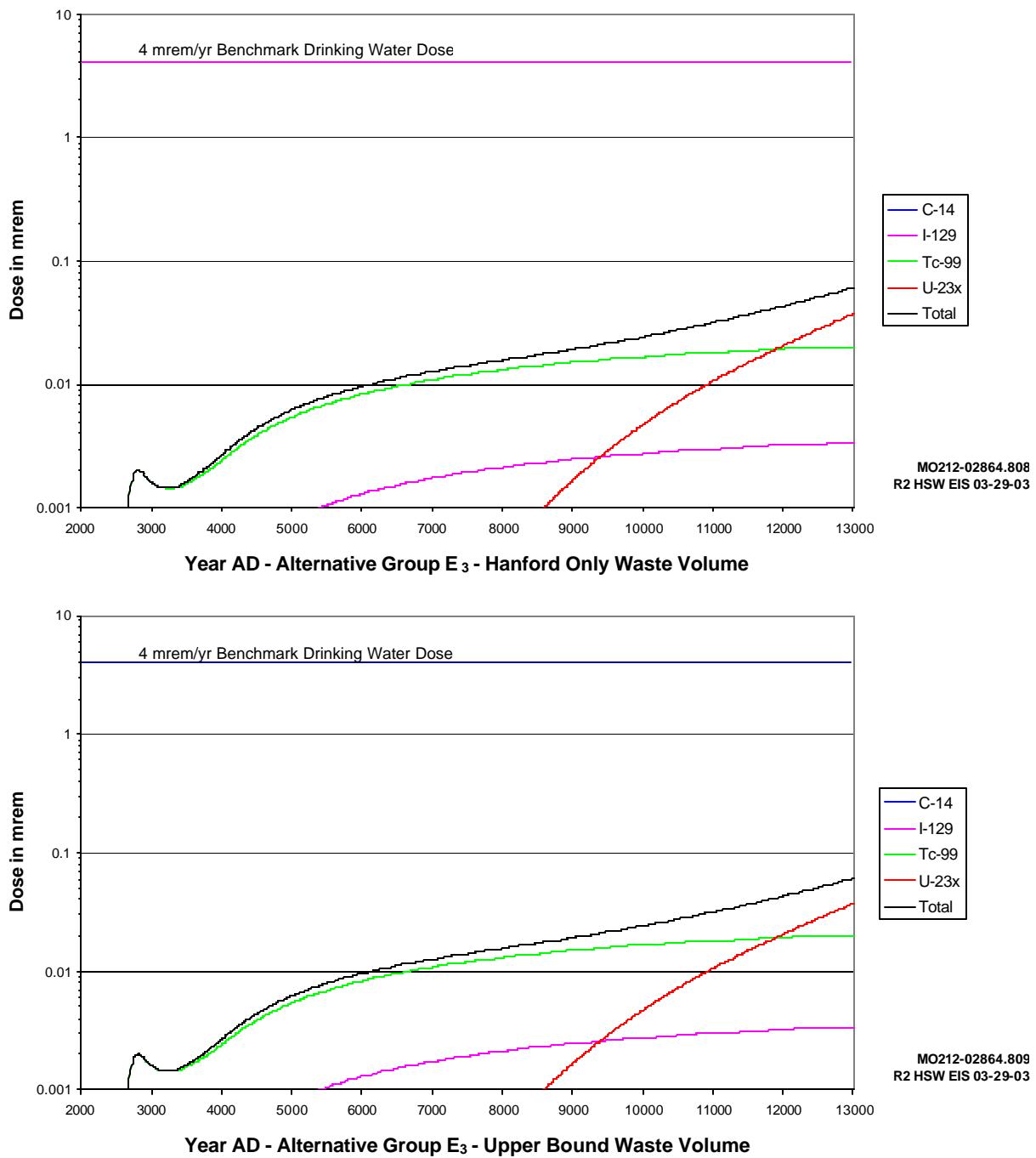


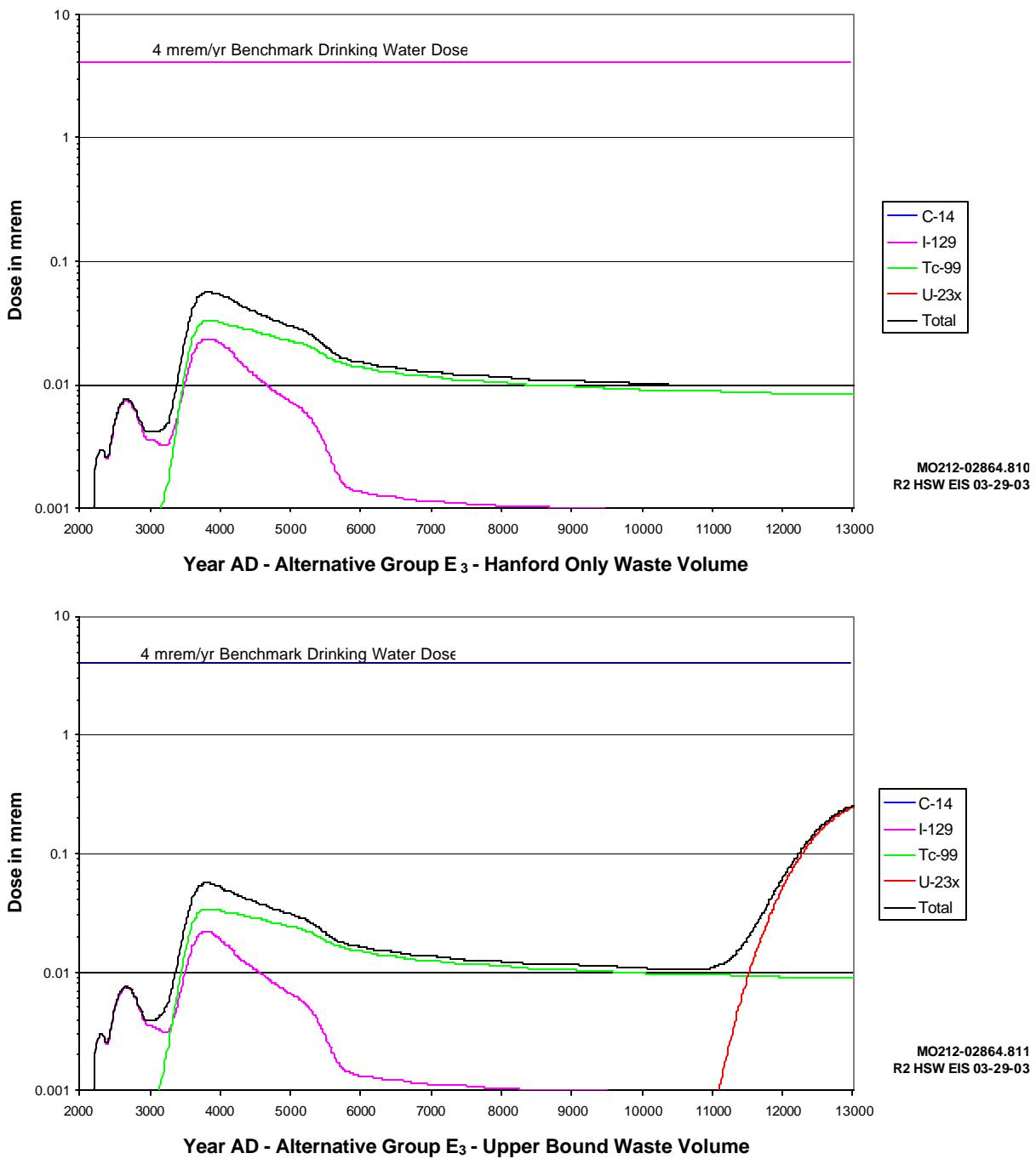


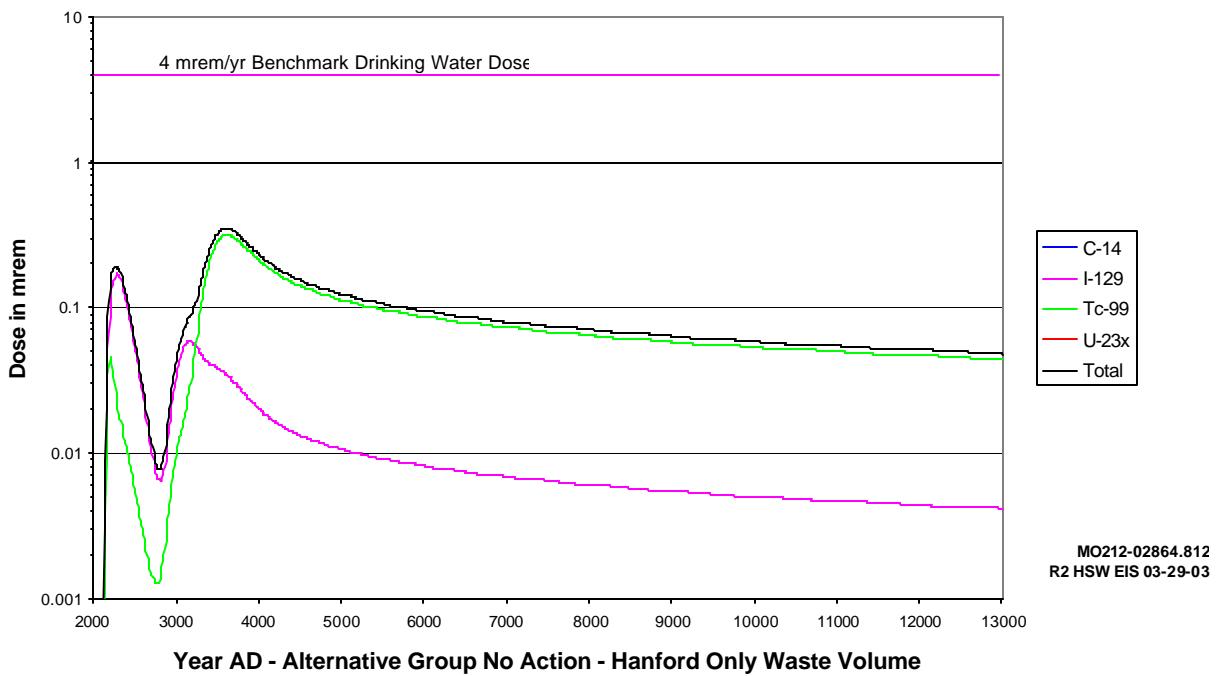




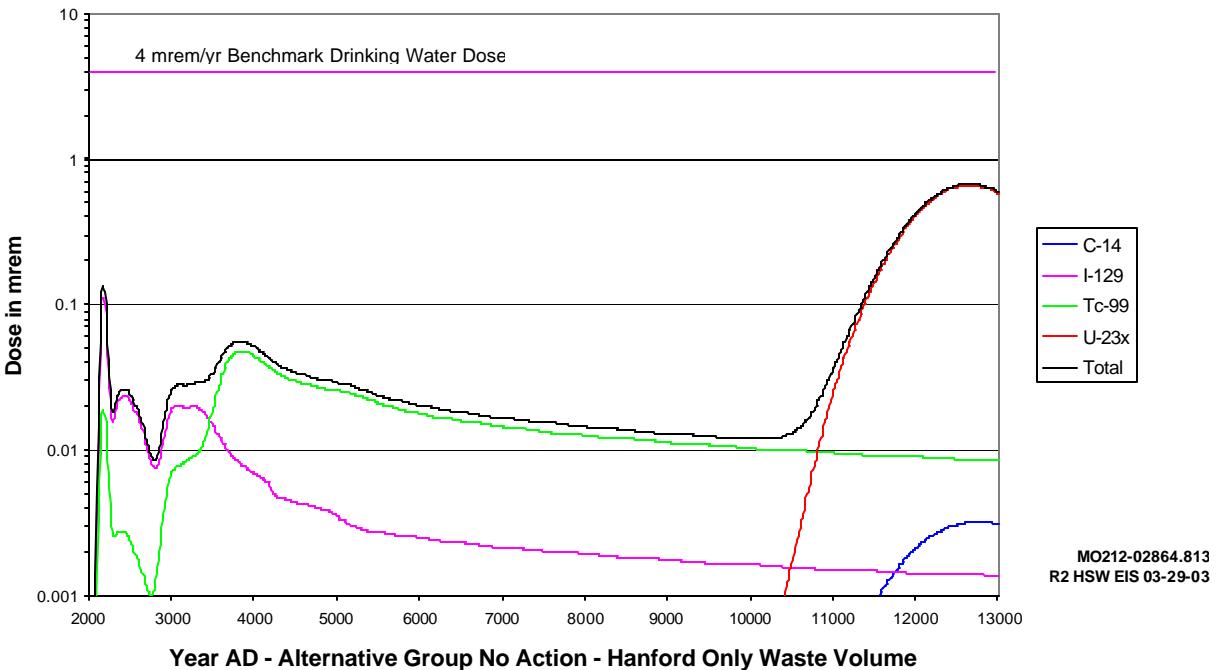




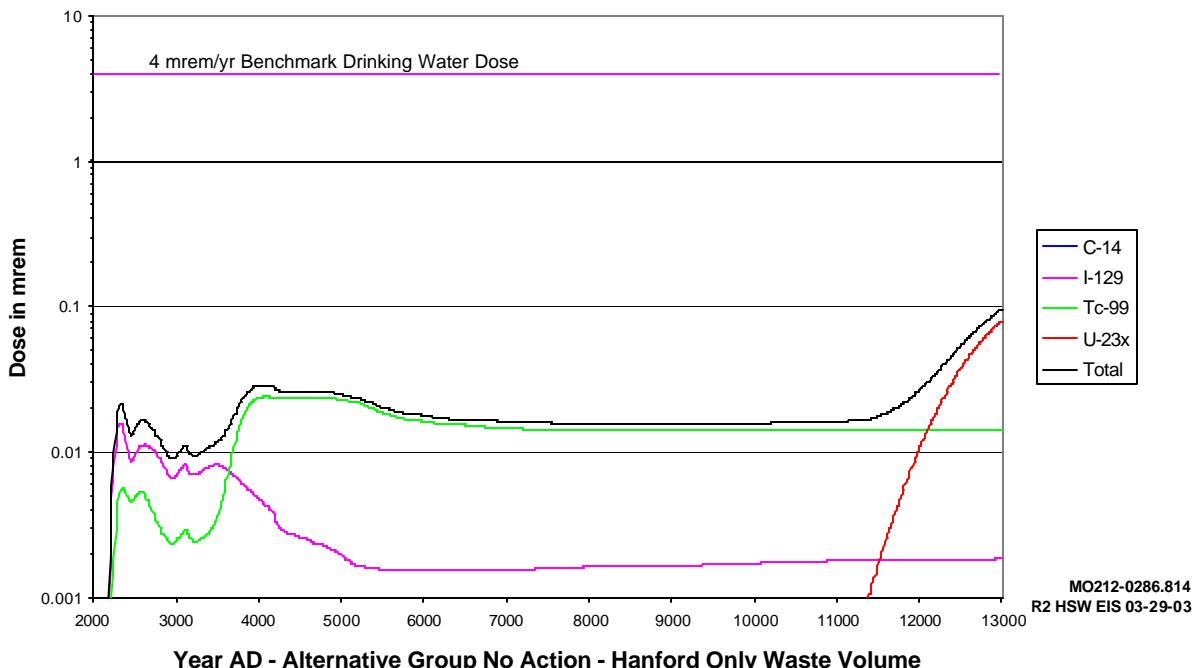




**Figure F.37.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well 1 km Down-Gradient from 200 West Area, No Action Alternative



**Figure F.38.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well 1 km Down-Gradient Northwest from 200 East Area, No Action Alternative



**Figure F.39.** Annual Drinking Water Dose at Various Times over 10,000 Years in Water from a Well Adjacent to the Columbia River, No Action Alternative

The radiation doses received from groundwater are evaluated using dose conversion factors specific to radionuclides and exposure scenarios. The dose factors used for drinking water ingestion, resident gardener, and resident gardener with sauna/sweat lodge are given in Table F.52.

**Table F.52.** Exposure Scenario Dose Factors for Use of Groundwater

Radionuclide	Annual Dose Factor by Exposure Scenario (mrem/yr per pCi/L)		
	Drinking Water	Resident Gardener	Resident Gardener with Sauna
C14	1.53E-03	4.09E-02	4.43E-02
Tc99	1.07E-03	3.66E-03	1.74E-02
I129	2.02E-01	6.20E-01	9.06E-01
U233	2.11E-01	2.56E-01	2.22E+02
U234	2.07E-01	2.51E-01	2.17E+02
U235	1.94E-01	2.35E-01	2.02E+02
U236	1.97E-01	2.39E-01	2.06E+02
U238	1.86E-01	2.26E-01	1.94E+02

A summary of groundwater dose results as a function of time is presented in Section 5.11.2 for each alternative. This section presents tables of the peak impacts and the time of peak impact by waste stream and period of disposal. These tables also present the health impact estimates for the resident gardener scenario with the sauna/sweat lodge included. The contents of Tables F.54 through F.140 are indexed in Table F.53.

**Table F.53.** Content of Tables for Groundwater Analysis Results

Alternative	200 East Area 1-km Point of Analysis			200 West Area 1- km Point of Analysis			Columbia River Point of Analysis		
	Waste Volume			Waste Volume			Waste Volume		
	Hanford	Lower	Upper	Hanford	Lower	Upper	Hanford	Lower	Upper
Group A	F.53	F.54	F.55	F.56	F.57	F.58	F.59	F.60	F.61
Group B	F.62	F.63	F.64	F.65	F.66	F.67	F.68	F.69	F.70
Group C	F.71	F.72	F.73	F.74	F.75	F.76	F.77	F.78	F.79
Group D <sub>1</sub>	F.80	F.81	F.82	F.83	F.84	F.85	F.86	F.87	F.88
Group D <sub>2</sub>	F.89	F.90	F.91	F.92	F.93	F.94	F.95	F.96	F.97
Group D <sub>3</sub>	F.98	F.99	F.100	F.101	F.102	F.103	F.104	F.105	F.106
Group E <sub>1</sub>	F.107	F.108	F.109	F.110	F.111	F.112	F.113	F.114	F.115
Group E <sub>2</sub>	F.116	F.117	F.118	F.119	F.120	F.121	F.122	F.123	F.124
Group E <sub>3</sub>	F.125	F.126	F.127	F.128	F.129	F.130	F.131	F.132	F.133
No Action	F.134	F.135	NA	F.136	F.137	NA	F.138	F.139	NA

NA = not applicable.

1      **Table F.54.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater over 10,000 Years – Alternative  
 3      Group A, Hanford Only Waste Volume  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.6E-05	4.8E-04	2.9E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	9.3E-06	2.8E-04	1.7E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	670	1.0E-05	3.0E-04	1.8E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	7.7E-04	2.3E-02	1.4E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1           **Table F.55.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East  
 2           Area Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3           Alternative Group A, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.0E-05	5.9E-04	3.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	1.1E-05	3.4E-04	2.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1390	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	4.2E-05	1.3E-03	7.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	7.8E-04	2.3E-02	1.4E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.56.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group A, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.3E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.1E-05	6.2E-04	3.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1590	5.6E-04	1.7E-02	1.0E-05
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	1.1E-05	3.4E-04	2.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1360	8.1E-04	2.4E-02	1.5E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	670	1.0E-05	3.0E-04	1.8E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	4.2E-05	1.3E-03	7.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.1E-03	6.4E-02	3.8E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	7.7E-04	2.3E-02	1.4E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.57.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group A, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.7E-05	8.2E-04	4.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	7.6E-05	2.3E-03	1.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	4.8E-05	1.5E-03	8.7E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	1.8E-04	5.4E-03	3.2E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.58.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group A, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.3E-05	2.8E-03	1.7E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	5.9E-05	1.8E-03	1.1E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	2.2E-04	6.5E-03	3.9E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05

- (a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.
- (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.
- (c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.59.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group A, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.8E-05	3.0E-03	1.8E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	5.9E-05	1.8E-03	1.1E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	2.2E-04	6.6E-03	4.0E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.  
 (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.  
 (c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.60.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group A,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	6.7E-06	2.0E-04	1.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	4.5E-06	1.3E-04	8.1E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	8.2E-05	2.5E-03	1.5E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	940	1.2E-06	3.7E-05	2.2E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	1.7E-05	5.0E-04	3.0E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.7E-04	1.1E-02	6.7E-06
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.7E-03	5.2E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.1E-05	3.2E-04	1.9E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.61.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group A,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.1E-06	2.4E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	5.5E-06	1.6E-04	8.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	8.2E-05	2.5E-03	1.2E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	1.7E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	940	1.2E-06	3.7E-05	1.8E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	2.0E-05	6.1E-04	3.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.7E-04	1.1E-02	6.7E-06
MLLW	200 East Area	Resident Gardener + Sauna	1590	2.9E-04	8.8E-03	5.3E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.1E-05	4.6E-04	2.8E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.62.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group A,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	810	2.8E-05	8.4E-04	5.0E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.6E-06	2.6E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	810	7.9E-05	2.4E-03	1.4E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	5.5E-06	1.7E-04	9.9E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	8.2E-05	2.5E-03	1.5E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.3E-03	2.0E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	940	1.2E-06	3.7E-05	2.2E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	2.0E-05	6.1E-04	3.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.7E-04	1.1E-02	6.7E-06
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.7E-03	5.2E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.1E-05	3.2E-04	1.9E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.63.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.5E-06	1.7E-04	1.0E-07
	200 East Area	Resident Gardener	1230	8.5E-07	2.5E-05	1.5E-08
LLW Cat 3	200 West Area	Resident Gardener	1450	3.3E-06	1.0E-04	6.0E-08
	200 East Area	Resident Gardener	620	6.0E-06	1.8E-04	1.1E-07
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.5E-05	4.6E-04	2.8E-07
	200 East Area	Resident Gardener + Sauna	10000	3.0E-04	9.0E-03	5.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.7E-04	2.8E-07
	200 East Area	Resident Gardener + Sauna	620	2.9E-05	8.6E-04	5.2E-07
MLLW	200 West Area	Resident Gardener + Sauna	1420	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1920	9.5E-06	2.8E-04	1.7E-07
	200 East Area	Resident Gardener	1320	1.1E-06	3.2E-05	1.9E-08
LLW Cat 3	200 West Area	Resident Gardener	1450	1.6E-04	4.9E-03	2.9E-06
	200 East Area	Resident Gardener	10000	3.0E-04	9.1E-03	5.4E-06
MLLW	200 East Area	Resident Gardener	1360	8.0E-04	2.4E-02	1.4E-05
Melters	200 East Area	Resident Gardener	680	2.6E-07	7.7E-06	4.6E-09
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1920	3.5E-05	1.1E-03	6.3E-07
	200 East Area	Resident Gardener + Sauna	1320	3.9E-06	1.2E-04	7.0E-08
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.3E-04	2.2E-02	1.3E-05
	200 East Area	Resident Gardener + Sauna	10000	2.4E-01	7.3E+00	4.4E-03
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.1E-03	6.2E-02	3.7E-05
Melters	200 East Area	Resident Gardener + Sauna	680	1.2E-06	3.6E-05	2.2E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.64.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	6.8E-06	2.0E-04	1.2E-07
	200 East Area	Resident Gardener	1230	1.0E-06	3.1E-05	1.9E-08
LLW Cat 3	200 West Area	Resident Gardener	1450	3.3E-06	1.0E-04	6.0E-08
	200 East Area	Resident Gardener	620	4.2E-07	1.3E-05	7.6E-09
MLLW	200 West Area	Resident Gardener	1810	2.3E-05	6.8E-04	4.1E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.9E-05	5.6E-04	3.4E-07
	200 East Area	Resident Gardener + Sauna	10000	3.5E-04	1.0E-02	6.3E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.7E-04	2.8E-07
	200 East Area	Resident Gardener + Sauna	10000	2.3E-06	6.8E-05	4.1E-08
MLLW	200 West Area	Resident Gardener + Sauna	1810	2.0E-04	5.9E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1920	1.2E-05	3.5E-04	2.1E-07
	200 East Area	Resident Gardener	1320	1.3E-06	3.8E-05	2.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1450	1.6E-04	4.9E-03	2.9E-06
	200 East Area	Resident Gardener	10000	3.1E-04	9.3E-03	5.6E-06
MLLW	200 East Area	Resident Gardener	1360	8.0E-04	2.4E-02	1.4E-05
Melters	200 East Area	Resident Gardener	680	2.6E-07	7.7E-06	4.6E-09
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1920	4.3E-05	1.3E-03	7.7E-07
	200 East Area	Resident Gardener + Sauna	10000	7.5E-04	2.2E-02	1.3E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.3E-04	2.2E-02	1.3E-05
	200 East Area	Resident Gardener + Sauna	10000	2.5E-01	7.5E+00	4.5E-03
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.1E-03	6.2E-02	3.7E-05
Melters	200 East Area	Resident Gardener + Sauna	680	1.2E-06	3.6E-05	2.2E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.65.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	6.3E-06	1.9E-04	1.1E-07
	200 East Area	Resident Gardener	1230	3.9E-06	1.2E-04	7.1E-08
LLW Cat 3	200 West Area	Resident Gardener	1450	3.3E-06	1.0E-04	6.0E-08
	200 East Area	Resident Gardener	620	4.4E-07	1.3E-05	7.9E-09
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.6E-03	7.8E-02	4.7E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.8E-05	5.4E-04	3.2E-07
	200 East Area	Resident Gardener + Sauna	10000	5.5E-05	1.6E-03	9.8E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.7E-04	2.8E-07
	200 East Area	Resident Gardener + Sauna	10000	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1920	1.0E-05	3.1E-04	1.9E-07
	200 East Area	Resident Gardener	1210	6.1E-06	1.8E-04	1.1E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.6E-04	4.9E-03	2.9E-06
	200 East Area	Resident Gardener	10000	3.1E-04	9.4E-03	5.6E-06
MLLW	200 East Area	Resident Gardener	1240	1.0E-03	3.1E-02	1.8E-05
Melters	200 East Area	Resident Gardener	680	2.6E-07	7.7E-06	4.6E-09
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1920	3.9E-05	1.2E-03	7.0E-07
	200 East Area	Resident Gardener + Sauna	1210	2.3E-05	7.0E-04	4.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.3E-04	2.2E-02	1.3E-05
	200 East Area	Resident Gardener + Sauna	10000	2.5E-01	7.6E+00	4.5E-03
MLLW	200 East Area	Resident Gardener + Sauna	1240	2.7E-03	8.0E-02	4.8E-05
Melters	200 East Area	Resident Gardener + Sauna	680	1.2E-06	3.6E-05	2.2E-08
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

1      **Table F.66.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.6E-05	7.9E-04	4.7E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.3E-05	7.0E-04	4.2E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	7.3E-05	2.2E-03	1.3E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.1E-04	3.3E-03	2.0E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 West Area	Resident Gardener	1770	5.0E-05	1.5E-03	9.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	1.1E-03	3.4E-02	2.1E-05
ILAW	200 West Area	Resident Gardener	10000	3.1E-04	9.2E-03	5.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1770	1.8E-04	5.5E-03	3.3E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.1E-03	1.5E-01	9.2E-05
ILAW	200 West Area	Resident Gardener + Sauna	10000	1.1E-01	3.3E-00	2.0E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.67.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.2E-05	9.6E-04	5.8E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.3E-05	7.0E-04	4.2E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	8.9E-05	2.7E-03	1.6E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.1E-04	3.3E-03	2.0E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1770	6.1E-05	1.8E-03	1.1E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.1E-03	3.4E-02	2.1E-05
ILAW	200 West Area	Resident Gardener	10000	3.1E-04	9.2E-03	5.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	2.4E-02	7.3E-01	4.4E-04
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.1E-03	1.5E-01	9.2E-05
ILAW	200 West Area	Resident Gardener + Sauna	10000	1.1E-01	3.3E-00	2.0E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.  
 (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.  
 (c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.68.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group B, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.0E-05	8.9E-04	5.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.3E-05	7.0E-04	4.2E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.6E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	8.5E-05	2.5E-03	1.5E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.1E-04	3.3E-03	2.0E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.4E-04	1.6E-02	9.7E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1770	5.5E-05	1.6E-03	9.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	1.1E-03	3.4E-02	2.1E-05
ILAW	200 West Area	Resident Gardener	10000	3.1E-04	9.2E-03	5.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	2.1E-02	6.2E-01	3.7E-04
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.1E-03	1.5E-01	9.2E-05
ILAW	200 West Area	Resident Gardener + Sauna	10000	1.1E-01	3.3E-00	2.0E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.69** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group B,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.3E-06	6.9E-05	4.1E-08
	200 East Area	Resident Gardener	1400	1.4E-07	4.3E-06	2.6E-09
LLW Cat 3	200 West Area	Resident Gardener	1710	1.6E-06	4.9E-05	2.9E-08
	200 East Area	Resident Gardener	860	1.4E-06	4.2E-05	2.5E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	6.4E-06	1.9E-04	1.2E-07
	200 East Area	Resident Gardener + Sauna	10000	1.2E-05	3.7E-04	2.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	7.7E-06	2.3E-04	1.4E-07
	200 East Area	Resident Gardener + Sauna	860	6.7E-06	2.0E-04	1.2E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2110	4.5E-06	1.4E-04	8.2E-08
	200 East Area	Resident Gardener	2330	1.2E-05	3.5E-04	2.1E-07
LLW Cat 3	200 West Area	Resident Gardener	1710	7.9E-05	2.4E-03	1.4E-06
	200 East Area	Resident Gardener	10000	2.9E-04	8.6E-03	5.2E-06
MLLW	200 East Area	Resident Gardener	1980	1.3E-04	3.8E-03	2.3E-06
ILAW	200 West Area	Resident Gardener	10000	1.0E-05	3.0E-04	1.8E-07
Melters	200 East Area	Resident Gardener	940	3.2E-08	9.5E-07	5.7E-10
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2110	1.7E-05	5.0E-04	3.0E-07
	200 East Area	Resident Gardener + Sauna	10000	6.4E-04	1.9E-02	1.2E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.6E-04	1.1E-02	6.4E-06
	200 East Area	Resident Gardener + Sauna	10000	2.4E-01	7.3E+00	4.4E-03
MLLW	200 East Area	Resident Gardener + Sauna	1610	3.2E-04	9.5E-03	5.7E-06
ILAW	200 West Area	Resident Gardener + Sauna	10000	2.6E-05	7.8E-02	4.7E-05
Melters	200 East Area	Resident Gardener + Sauna	940	1.5E-07	4.5E-06	2.7E-09

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.70.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group B,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.8E-06	8.4E-05	5.0E-08
	200 East Area	Resident Gardener	1400	1.7E-07	5.2E-06	3.1E-09
LLW Cat 3	200 West Area	Resident Gardener	1710	1.6E-06	4.9E-05	2.9E-08
	200 East Area	Resident Gardener	860	9.8E-08	2.9E-06	1.8E-09
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.8E-06	2.3E-04	1.4E-07
	200 East Area	Resident Gardener + Sauna	10000	1.3E-05	3.9E-04	2.3E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	7.7E-06	2.3E-04	1.4E-07
	200 East Area	Resident Gardener + Sauna	860	4.6E-07	1.4E-05	8.4E-09
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2110	5.5E-06	1.7E-04	1.0E-07
	200 East Area	Resident Gardener	2250	1.4E-05	4.2E-04	2.5E-07
LLW Cat 3	200 West Area	Resident Gardener	1710	7.9E-05	2.4E-03	1.4E-06
	200 East Area	Resident Gardener	10000	3.0E-04	8.9E-03	5.3E-06
MLLW	200 East Area	Resident Gardener	1420	1.3E-04	3.8E-03	2.3E-06
ILAW	200 West Area	Resident Gardener	10000	1.0E-05	3.0E-04	1.8E-07
Melters	200 East Area	Resident Gardener	940	3.2E-08	9.5E-07	5.7E-10
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2110	2.0E-05	6.1E-04	3.7E-07
	200 East Area	Resident Gardener + Sauna	10000	7.4E-04	2.2E-02	1.3E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.6E-04	1.1E-02	6.4E-06
	200 East Area	Resident Gardener + Sauna	10000	2.5E-01	7.5E+00	4.5E-03
MLLW	200 East Area	Resident Gardener + Sauna	1420	3.3E-04	1.0E-02	6.0E-06
ILAW	200 West Area	Resident Gardener + Sauna	10000	2.6E-05	7.8E-02	4.7E-05
Melters	200 East Area	Resident Gardener + Sauna	940	1.5E-07	4.5E-06	2.7E-09

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.71.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group B,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.6E-06	7.8E-05	4.7E-08
	200 East Area	Resident Gardener	1400	6.6E-07	2.0E-05	1.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.6E-06	4.9E-05	2.9E-08
	200 East Area	Resident Gardener	860	9.8E-08	2.9E-06	1.8E-09
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	6.7E-05	2.0E-03	1.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.4E-06	2.2E-04	1.3E-07
	200 East Area	Resident Gardener + Sauna	1400	5.3E-05	1.6E-03	9.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	7.7E-06	2.3E-04	1.4E-07
	200 East Area	Resident Gardener + Sauna	860	6.4E-07	1.9E-05	1.2E-08
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.1E+00	6.4E-04
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2110	5.0E-06	1.5E-04	9.0E-08
	200 East Area	Resident Gardener	10000	6.1E-06	1.8E-04	1.1E-07
LLW Cat 3	200 West Area	Resident Gardener	1710	7.9E-05	2.4E-03	1.4E-06
	200 East Area	Resident Gardener	10000	3.0E-04	8.9E-03	5.3E-06
MLLW	200 East Area	Resident Gardener	1420	1.3E-04	4.0E-03	2.4E-06
ILAW	200 West Area	Resident Gardener	10000	1.0E-05	3.0E-04	1.8E-07
Melters	200 East Area	Resident Gardener	940	3.2E-08	9.5E-07	5.7E-10
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2110	1.9E-05	5.6E-04	3.3E-07
	200 East Area	Resident Gardener + Sauna	10000	4.0E-03	1.2E-01	7.2E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.6E-04	1.1E-02	6.4E-06
	200 East Area	Resident Gardener + Sauna	10000	2.5E-01	7.6E+00	4.5E-03
MLLW	200 East Area	Resident Gardener + Sauna	1420	3.6E-04	1.1E-02	6.5E-06
ILAW	200 West Area	Resident Gardener + Sauna	10000	2.6E-05	7.8E-02	4.7E-05
Melters	200 East Area	Resident Gardener + Sauna	940	1.5E-07	4.5E-06	2.7E-09

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.72.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.6E-05	4.8E-04	2.9E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	6.3E-06	1.9E-04	1.1E-07
LLW Cat 3	200 West Area	Resident Gardener	1460	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	6.9E-06	2.1E-04	1.2E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	3.0E-05	9.0E-04	5.4E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1460	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	8.0E-04	2.4E-02	1.4E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.73.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.0E-05	5.9E-04	3.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	7.7E-06	2.3E-04	1.4E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	6.9E-06	2.1E-04	1.2E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	3.7E-05	1.1E-03	6.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	8.0E-04	2.4E-02	1.4E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.74.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.3E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.1E-05	6.2E-04	3.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2070	7.7E-06	2.3E-04	1.4E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	1.7E-04	5.0E-03	3.0E-06
MLLW	200 East Area	Resident Gardener	1360	8.1E-04	2.4E-02	1.5E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	6.9E-06	2.1E-04	1.2E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2070	3.7E-05	1.1E-03	6.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	7.6E-04	2.3E-02	1.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.1E-03	6.4E-02	3.8E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	8.0E-04	2.4E-02	1.4E-05
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.75.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.7E-05	8.2E-04	4.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	7.6E-05	2.3E-03	1.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	4.8E-05	1.5E-03	8.7E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	1.8E-04	5.4E-03	3.2E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period. (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one. (c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.76.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.3E-05	2.8E-03	1.7E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	5.9E-05	1.8E-03	1.1E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	2.2E-04	6.5E-03	3.9E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05

- (a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.
- (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.
- (c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.77.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group C, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.8E-05	3.0E-03	1.8E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	5.9E-04	1.8E-02	1.1E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1910	5.9E-05	1.8E-03	1.1E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1910	2.2E-04	6.6E-03	4.0E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.3E-03	1.6E-01	9.6E-05
<p>(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.</p> <p>(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.</p> <p>(c) Results are not reported for cases that had no inventory reported for the waste.</p>						

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1      **Table F.78.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group C,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	6.7E-06	2.0E-04	1.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	4.5E-06	1.3E-04	8.1E-08
LLW Cat 3	200 West Area	Resident Gardener	1720	7.6E-05	2.3E-03	1.4E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	820	7.5E-07	2.2E-05	1.3E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	1.7E-05	5.0E-04	3.0E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1720	3.6E-04	1.1E-02	6.5E-06
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	5.3E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.3E-05	3.9E-04	2.4E-07

- (a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.
- (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.
- (c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.79.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group C,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.1E-06	2.4E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	5.5E-06	1.6E-04	8.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1720	7.8E-05	2.3E-03	1.2E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	1.7E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	1.9E-07
Melters	200 East Area	Resident Gardener	820	7.6E-07	2.3E-05	1.1E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	2.0E-05	6.1E-04	3.0E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1720	3.6E-04	1.1E-02	5.4E-06
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	4.4E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	4.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.3E-05	3.9E-04	2.0E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.80.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group C,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	940	3.9E-06	1.2E-04	7.0E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.6E-06	2.6E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	940	1.9E-05	5.6E-04	3.3E-07
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2260	5.5E-06	1.7E-04	9.9E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	7.8E-05	2.3E-03	1.4E-06
MLLW	200 East Area	Resident Gardener	1580	1.2E-04	3.6E-03	2.1E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	820	7.5E-07	2.2E-05	1.3E-08
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2260	2.0E-05	6.1E-04	3.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	3.6E-04	1.1E-02	6.5E-06
MLLW	200 East Area	Resident Gardener + Sauna	1580	3.2E-04	9.7E-03	5.8E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.3E-05	3.9E-04	2.4E-07
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.81.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.5E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1380	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 East Area	Resident Gardener	1380	5.8E-04	1.7E-02	1.0E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	4.7E-03	1.4E-01	8.5E-05
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1380	1.5E-03	4.5E-02	2.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.6E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.82.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.1E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.6E-05	1.1E-03	6.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1380	4.2E-05	1.3E-03	7.6E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 East Area	Resident Gardener	1380	5.8E-04	1.7E-02	1.0E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	5.5E-01	1.7E+01	1.0E-02
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1380	1.5E-03	4.5E-02	2.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.7E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.83.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.4E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	7.6E-05	2.3E-03	1.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1380	4.3E-05	1.3E-03	7.8E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.5E-04	1.6E-02	9.8E-06
MLLW	200 East Area	Resident Gardener	1380	6.0E-04	1.8E-02	1.1E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	1380	1.6E-04	4.7E-03	2.8E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1380	1.6E-03	4.7E-02	2.8E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.7E-04	1.7E-02	1.0E-05
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.84.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.9E-05	8.6E-04	5.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-02	2.2E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.4E-04	4.2E-03	2.5E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.85.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.5E-05	1.0E-03	6.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.4E-03	4.3E-02	2.6E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.4E-04	4.2E-03	2.5E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.86.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>1</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	1.9E-04	5.6E-03	3.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.8E-05	3.0E-03	1.8E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	5.3E-04	1.6E-02	9.6E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.87.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>1</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1510	4.0E-06	1.2E-04	7.3E-08
LLW Cat 3	200 East Area	Resident Gardener	860	1.2E-04	3.6E-03	2.2E-06
MLLW	200 East Area	Resident Gardener	1500	6.8E-05	2.0E-03	1.2E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	10000	1.9E-09	5.6E-08	3.4E-11
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	6.3E-05	1.9E-03	1.1E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	820	5.6E-04	1.7E-02	1.0E-05
MLLW	200 East Area	Resident Gardener + Sauna	1500	1.8E-04	5.3E-03	3.2E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.6E-06	4.8E-05	2.9E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.88.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>1</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.5E-06	2.6E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1510	4.9E-06	1.5E-04	8.9E-08
LLW Cat 3	200 East Area	Resident Gardener	820	6.7E-05	2.0E-03	1.2E-06
MLLW	200 East Area	Resident Gardener	1500	6.8E-05	2.0E-03	1.2E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	850	1.4E-06	4.2E-05	2.5E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	7.3E-05	2.2E-03	1.3E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	820	3.0E-04	9.0E-03	5.4E-06
MLLW	200 East Area	Resident Gardener + Sauna	1500	1.8E-04	5.3E-03	3.2E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	1.4E-05	4.1E-04	2.4E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.89.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>1</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.1E-05	2.4E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.6E-06	2.6E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1510	4.9E-06	1.5E-04	8.8E-08
LLW Cat 3	200 East Area	Resident Gardener	820	6.7E-05	2.0E-03	1.2E-06
MLLW	200 East Area	Resident Gardener	1500	7.5E-05	2.3E-03	1.4E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	10000	4.4E-08	1.3E-06	7.9E-10
LLW Cat 1	200 East Area	Resident Gardener + Sauna	1510	1.8E-05	5.4E-04	3.2E-07
LLW Cat 3	200 East Area	Resident Gardener + Sauna	820	3.0E-04	9.0E-03	5.4E-06
MLLW	200 East Area	Resident Gardener + Sauna	1500	2.1E-04	5.8E-03	3.5E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	7.1E-06	2.1E-04	1.3E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.90.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.5E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1320	2.8E-05	8.4E-04	5.0E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 East Area	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	7.5E-03	2.3E-01	1.4E-04
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	9.0E-04	2.7E-02	1.6E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.91.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.1E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.6E-05	1.1E-03	6.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1320	3.4E-05	1.0E-03	6.1E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 East Area	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	8.9E-03	2.7E-01	1.6E-04
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 East Area	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.7E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	9.0E-04	2.7E-02	1.6E-05
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

5

1      **Table F.92.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.4E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.1E-04	3.4E-03	2.1E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1320	3.6E-05	1.1E-03	6.4E-07
LLW Cat 3	200 East Area	Resident Gardener	620	5.5E-04	1.7E-02	9.9E-06
MLLW	200 East Area	Resident Gardener	1360	8.1E-04	2.4E-02	1.5E-05
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	980	2.4E-06	7.1E-05	4.3E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	1320	1.3E-04	3.8E-03	2.3E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	620	2.5E-03	7.5E-02	4.5E-05
MLLW	200 East Area	Resident Gardener + Sauna	1360	2.1E-03	6.3E-02	3.8E-05
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	8.9E-04	2.7E-02	1.6E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.93.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.9E-05	8.6E-04	5.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-02	2.2E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.94.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.5E-05	1.0E-03	6.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.4E-03	4.3E-02	2.6E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.95.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>2</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.8E-05	3.0E-03	1.8E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.96.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>2</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1530	7.6E-06	2.3E-04	1.4E-07
LLW Cat 3	200 East Area	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	2110	6.5E-08	2.0E-06	1.2E-09
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	8.7E-05	2.6E-03	1.6E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	860	5.7E-04	1.7E-02	1.0E-05
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	5.3E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	9.7E-06	2.9E-04	1.8E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.97.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>2</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.5E-06	2.6E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1530	9.3E-06	2.8E-04	1.7E-07
LLW Cat 3	200 East Area	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 East Area	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	850	1.4E-06	4.2E-05	2.5E-08
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	1.1E-04	3.3E-03	2.0E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	860	5.7E-04	1.7E-02	1.0E-05
MLLW	200 East Area	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	5.3E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	8.1E-06	2.4E-04	1.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.98.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>2</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2010	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.1E-05	2.4E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	9.8E-06	2.9E-04	1.8E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2010	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 East Area	Resident Gardener	1530	9.3E-06	2.8E-04	1.7E-07
LLW Cat 3	200 East Area	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 East Area	Resident Gardener	1580	1.2E-04	3.6E-03	2.1E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	2110	6.5E-08	2.0E-06	1.2E-09
LLW Cat 1	200 East Area	Resident Gardener + Sauna	10000	1.2E-04	3.5E-03	2.1E-06
LLW Cat 3	200 East Area	Resident Gardener + Sauna	860	5.7E-04	1.7E-02	1.0E-05
MLLW	200 East Area	Resident Gardener + Sauna	1580	3.1E-04	9.4E-03	5.6E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	10000	9.7E-06	2.9E-04	1.8E-07
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.99.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>3</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.6E-05	4.8E-04	2.9E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	2.7E-05	8.2E-04	4.9E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.8E-04	1.4E-02	8.6E-06
MLLW	200 ERDF Site	Resident Gardener	1790	4.6E-04	1.4E-02	8.3E-06
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.0E-04	3.0E-03	1.8E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.4E-02	3.9E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1790	1.2E-03	3.7E-02	2.2E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

- (a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.
- (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.
- (c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.100.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>3</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.0E-05	5.9E-04	3.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.8E-04	1.4E-02	8.6E-06
MLLW	200 ERDF Site	Resident Gardener	1790	4.6E-04	1.4E-02	6.9E-06
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.2E-04	3.7E-03	2.2E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.4E-02	3.9E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1790	1.2E-03	3.7E-02	2.2E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.101.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group D<sub>3</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.4E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.6E-03	7.8E-02	4.7E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.3E-04	4.0E-03	2.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.8E-04	1.4E-02	8.6E-06
MLLW	200 ERDF Site	Resident Gardener	1790	4.8E-04	1.4E-02	8.6E-06
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.3E-04	3.8E-03	2.3E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.4E-02	3.9E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1790	1.3E-03	3.8E-02	2.3E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.102.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group D<sub>3</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.7E-05	8.2E-04	4.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	7.6E-05	2.3E-03	1.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	5.0E-05	1.5E-03	9.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	8.9E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1740	8.4E-04	2.5E-02	1.5E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1740	1.9E-04	5.6E-03	3.3E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1740	2.2E-03	6.7E-02	4.0E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.103.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group D<sub>3</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.3E-05	2.8E-03	1.7E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	6.1E-05	1.8E-03	1.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	8.9E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1740	8.4E-04	2.5E-02	1.5E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1740	2.3E-04	6.8E-03	4.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1740	2.2E-03	6.5E-02	3.9E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.104.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group D<sub>3</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 West Area	Resident Gardener	1700	4.0E-05	1.2E-03	7.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	4.8E-03	1.5E-01	8.7E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05
<b>Projected New Waste (&gt; 2007)</b> <sup>(c)</sup>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	6.1E-05	1.8E-03	1.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	8.9E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1740	8.7E-04	2.6E-02	1.6E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	1.0E-02	3.1E-01	1.9E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1740	2.3E-03	6.8E-02	4.1E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.105.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>3</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	6.7E-06	2.0E-04	1.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	2010	4.4E-06	1.3E-04	8.0E-08
LLW Cat 3	200 ERDF Site	Resident Gardener	1420	7.8E-05	2.3E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	2010	7.6E-05	2.3E-03	1.4E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	2010	1.6E-05	4.9E-04	3.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	2010	2.0E-04	6.0E-03	3.6E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.106.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>3</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.1E-06	2.4E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	2010	5.4E-06	1.6E-04	9.8E-08
LLW Cat 3	200 ERDF Site	Resident Gardener	1420	7.8E-05	2.3E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	2010	7.6E-05	2.3E-03	1.4E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	2010	2.0E-05	6.0E-04	3.6E-07
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	2010	2.0E-04	6.0E-03	3.6E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08
<p>The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.            Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.            Results are not reported for cases that had no inventory reported for the waste.</p>						

5

1      **Table F.107.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group D<sub>3</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.5E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.1E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.1E-05	2.4E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.4E-05	4.3E-04	2.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1720	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	2010	5.4E-06	1.6E-04	9.8E-08
LLW Cat 3	200 ERDF Site	Resident Gardener	1420	7.8E-05	2.3E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	2010	8.0E-05	2.4E-03	1.4E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	4.2E-03	1.2E-01	7.5E-05
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	2010	2.2E-04	6.7E-03	4.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.108.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>1</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.5E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1320	2.8E-05	8.4E-04	5.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 ERDF Site	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	7.6E-03	2.3E-01	1.4E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	2.4E-03	7.3E-02	4.4E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1370	2.0E-03	6.1E-02	3.6E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.109.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>1</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.1E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.6E-05	1.1E-03	6.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1320	3.4E-05	1.0E-03	6.1E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 ERDF Site	Resident Gardener	1370	7.9E-04	2.4E-02	1.4E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	9.0E-03	2.7E-01	1.6E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	2.5E-03	7.4E-02	4.4E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1370	2.2E-03	6.5E-02	3.9E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.110.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>1</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.3E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	4.1E-05	1.2E-03	7.4E-07
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	4.3E-05	1.3E-03	7.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.2E-04	3.6E-03	2.2E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1320	3.4E-05	1.0E-03	6.1E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	5.4E-04	1.6E-02	9.7E-06
MLLW	200 ERDF Site	Resident Gardener	1370	8.1E-04	2.4E-02	1.5E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	1.4E-02	4.3E-01	2.6E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	2.4E-03	7.2E-02	4.3E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1370	2.1E-03	6.3E-02	3.8E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.111.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>1</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.9E-05	8.6E-04	5.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.3E-03	3.9E-02	2.4E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.4E-04	4.2E-03	2.5E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.112.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>1</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.5E-05	1.0E-03	6.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.4E-03	4.3E-02	2.6E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.113.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>1</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.7E-05	1.1E-03	6.6E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	2.2E-03	6.6E-02	4.0E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.114.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years -- Alternative Group E<sub>1</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1530	7.7E-06	2.3E-04	1.4E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 ERDF Site	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	1.4E-04	4.1E-03	2.5E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	860	5.7E-04	1.7E-02	1.0E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	5.3E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.5E-06	1.3E-04	8.0E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.115.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>1</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.5E-06	2.6E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1530	9.3E-06	2.8E-04	1.7E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 ERDF Site	Resident Gardener	1580	1.1E-04	3.4E-03	2.0E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	1.6E-04	4.8E-03	2.9E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	850	5.7E-04	1.7E-02	1.0E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1580	2.9E-04	8.8E-03	5.3E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.5E-06	1.3E-04	8.0E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.116.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>1</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.1E-05	2.4E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	9.0E-06	2.7E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1530	9.6E-06	2.9E-04	1.7E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	860	1.3E-04	3.8E-03	2.3E-06
MLLW	200 ERDF Site	Resident Gardener	1570	1.2E-04	3.5E-03	2.1E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	3.4E-04	1.0E-02	6.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	860	5.7E-04	1.7E-02	1.0E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1570	3.1E-04	9.4E-03	5.6E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.5E-06	1.3E-04	8.0E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.117.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – Alternative  
 3      Group E<sub>2</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.5E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1380	4.1E-05	1.2E-03	7.3E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	1.6E-04	4.8E-03	2.9E-06
MLLW	200 ERDF Site	Resident Gardener	1380	5.7E-04	1.7E-02	1.0E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	4.8E-03	1.4E-01	8.7E-05
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	7.7E-04	2.3E-02	1.4E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1380	1.4E-03	4.3E-02	2.6E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.118.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>2</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.1E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	3.6E-05	1.1E-03	6.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1380	4.9E-05	1.5E-03	8.9E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	1.6E-04	4.8E-03	2.9E-06
MLLW	200 ERDF Site	Resident Gardener	1380	5.6E-04	1.7E-02	1.0E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	5.5E-03	1.7E-01	1.0E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	7.7E-04	2.3E-02	1.4E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1380	1.4E-03	4.3E-02	2.6E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.119.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>2</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.3E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	10000	1.4E-04	4.3E-03	2.6E-06
	200 East Area	Resident Gardener	1220	1.4E-04	4.3E-03	2.6E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	4.3E-05	1.3E-03	7.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.7E-05	5.0E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	10000	1.2E-01	3.7E+00	2.2E-03
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1380	4.2E-05	1.3E-03	7.6E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	620	1.7E-04	5.0E-03	3.0E-06
MLLW	200 ERDF Site	Resident Gardener	1380	5.7E-04	1.7E-02	1.0E-05
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
Melters	200 ERDF Site	Resident Gardener	1130	5.3E-06	1.6E-04	9.5E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	9.4E-03	2.8E-01	1.7E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	620	8.0E-04	2.4E-02	1.4E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1380	1.4E-03	4.3E-02	2.6E-05
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03
Melters	200 ERDF Site	Resident Gardener + Sauna	1130	2.5E-05	7.6E-04	4.5E-07
The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period. Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one. Results are not reported for cases that had no inventory reported for the waste.						

5

1      **Table F.120.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>2</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose ,rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.9E-05	8.6E-04	5.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.3E-03	3.9E-02	2.4E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.121.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>2</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.5E-05	1.0E-03	6.3E-07
LLW Cat 3	200 West Area	Resident Gardener	680	1.3E-05	3.8E-04	2.3E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	1.3E-03	4.0E-02	2.4E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.122.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>2</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.7E-05	1.1E-03	6.6E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	10000	2.2E-03	6.6E-02	4.0E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.3E-04	3.8E-03	2.3E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
ILAW	200 ERDF Site	Resident Gardener	10000	3.5E-04	1.0E-02	6.0E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	1.2E-01	3.6E-00	2.2E-03

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.123.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>2</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	10000	5.4E-06	1.6E-04	9.8E-08
LLW Cat 3	200 ERDF Site	Resident Gardener	820	6.2E-05	1.9E-03	1.1E-06
MLLW	200 ERDF Site	Resident Gardener	1500	6.7E-05	2.0E-03	1.2E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	4.7E-03	1.4E-01	8.5E-05
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	820	3.1E-04	9.3E-03	5.6E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	1500	1.7E-04	5.2E-03	3.1E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.124.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>2</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.5E-06	2.6E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	10000	5.5E-03	1.7E-01	1.0E-04
LLW Cat 3	200 ERDF Site	Resident Gardener	820	6.7E-05	2.0E-03	1.2E-06
MLLW	200 ERDF Site	Resident Gardener	1500	6.7E-05	2.0E-03	1.2E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	2.1E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	5.6E-03	1.7E-01	1.0E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	820	3.2E-04	9.7E-03	5.8E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	1500	1.8E-04	5.3E-03	3.2E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.125.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>2</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.3E-05	2.5E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	9.0E-06	2.7E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	10000	1.1E-05	3.2E-04	1.9E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	820	6.2E-05	1.9E-03	1.1E-06
MLLW	200 ERDF Site	Resident Gardener	1500	7.0E-05	2.1E-03	1.3E-06
ILAW	200 ERDF Site	Resident Gardener	10000	1.2E-05	3.5E-04	1.8E-07
Melters	200 ERDF Site	Resident Gardener	1420	8.7E-07	2.6E-05	1.6E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	10000	9.2E-03	2.8E-01	1.7E-04
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	820	3.0E-04	9.0E-03	5.4E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	10000	3.1E-04	9.2E-03	5.5E-06
ILAW	200 ERDF Site	Resident Gardener + Sauna	10000	3.0E-05	9.0E-02	5.4E-05
Melters	200 ERDF Site	Resident Gardener + Sauna	1420	4.1E-06	1.2E-04	7.4E-08
(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.						
(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.						
(c) Results are not reported for cases that had no inventory reported for the waste.						

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1      **Table F.126.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>3</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	10000	2.6E-04	7.8E-03	4.7E-06
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	5.8E-06	1.7E-04	1.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	1.6E-05	4.8E-04	2.9E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	5.5E-05	1.7E-03	9.9E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.5E-04	1.4E-02	8.1E-06
MLLW	200 ERDF Site	Resident Gardener	1130	2.1E-05	6.4E-04	3.8E-07
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	7.5E-06	2.3E-04	1.4E-07
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.3E-04	3.9E-03	2.4E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.3E-02	3.8E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1130	1.0E-04	3.0E-03	1.8E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.6E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.127.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>3</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.0E-06	2.1E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	7.3E-05	2.2E-03	1.3E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.0E-05	5.9E-04	3.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.9E-04	5.8E-03	3.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	6.7E-05	2.0E-03	1.2E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.5E-04	1.4E-02	8.2E-06
MLLW	200 ERDF Site	Resident Gardener	1130	2.1E-05	6.4E-04	3.9E-07
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	7.5E-06	2.3E-04	1.4E-07
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.6E-04	4.8E-03	2.9E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.3E-02	3.8E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1130	1.0E-04	3.0E-03	1.8E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.6E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.128.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years –  
 3      Alternative Group E<sub>3</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.0E-06	6.1E-05	3.6E-08
	200 East Area	Resident Gardener	10000	7.0E-05	2.1E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.7E-06	2.6E-04	1.6E-07
	200 East Area	Resident Gardener + Sauna	10000	6.1E-02	1.8E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	5.4E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-04	5.8E-07
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	7.9E-08
	200 East Area	Resident Gardener + Sauna	10000	1.2E-03	3.7E-03	2.2E-06
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	1.1E-06
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	3.1E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.2E-03	1.9E-06
	200 East Area	Resident Gardener + Sauna	110	2.7E-02	8.0E-01	4.8E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1810	7.3E-06	2.2E-04	1.3E-07
LLW Cat 3	200 West Area	Resident Gardener	1450	3.5E-06	1.0E-04	6.2E-08
MLLW	200 West Area	Resident Gardener	1810	3.9E-05	1.2E-03	7.1E-07
	200 East Area	Resident Gardener	10000	2.8E-03	8.3E-02	5.0E-05
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1810	2.1E-05	6.2E-04	3.7E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1450	1.6E-05	4.9E-04	3.0E-07
MLLW	200 West Area	Resident Gardener + Sauna	1810	1.1E-04	3.4E-03	2.0E-06
	200 East Area	Resident Gardener + Sauna	10000	2.2E+00	6.7E+01	4.0E-02
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1800	6.8E-05	2.0E-03	1.2E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1130	4.5E-04	1.4E-02	8.1E-06
MLLW	200 ERDF Site	Resident Gardener	1130	4.6E-05	1.4E-03	8.2E-07
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
Melters	200 East Area	Resident Gardener	680	6.9E-06	2.1E-04	1.2E-07
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1800	1.6E-04	4.8E-03	2.9E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1130	2.1E-03	6.3E-02	3.8E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1130	2.2E-04	6.5E-03	3.9E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04
Melters	200 East Area	Resident Gardener + Sauna	10000	5.6E-04	1.7E-02	1.0E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.129.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>3</sub>, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	2.7E-05	8.2E-04	4.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	7.6E-05	2.3E-03	1.4E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	5.1E-05	1.5E-03	9.1E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	8.9E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1070	4.0E-05	1.2E-03	7.3E-07
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1070	1.9E-04	5.6E-03	3.4E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1070	1.9E-04	5.7E-03	3.4E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.130.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over 10,000  
 3      Years – Alternative Group E<sub>3</sub>, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.3E-05	1.0E-03	6.0E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1700	3.4E-04	1.0E-02	6.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.3E-05	2.8E-03	1.7E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1700	9.2E-04	2.8E-02	1.7E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	6.2E-05	1.9E-03	1.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	8.9E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1070	4.0E-05	1.2E-03	7.3E-07
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1740	2.3E-04	6.8E-03	4.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1070	1.9E-04	5.7E-03	3.4E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.131.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      and 200 ERDF Site Point of Analysis from Radionuclides in the Groundwater Over  
 3      10,000 Years – Alternative Group E<sub>3</sub>, Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	2.2E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	9.1E-07
1970 – 1988	200 West Area	Resident Gardener	290	1.8E-05	5.5E-04	3.3E-07
	200 West Area	Resident Gardener + Sauna	290	2.7E-05	8.1E-04	4.9E-07
1988 – 1995	200 West Area	Resident Gardener	250	3.3E-04	9.9E-03	6.0E-06
	200 West Area	Resident Gardener + Sauna	250	4.8E-04	1.5E-02	8.7E-06
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	1700	3.4E-05	1.0E-03	6.2E-07
LLW Cat 3	200 West Area	Resident Gardener	1230	2.4E-05	7.3E-04	4.4E-07
MLLW	200 West Area	Resident Gardener	1690	1.9E-04	5.7E-03	3.4E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1700	9.8E-05	3.0E-03	1.8E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	1.2E-04	3.5E-03	2.1E-06
MLLW	200 West Area	Resident Gardener + Sauna	1690	5.6E-04	1.7E-02	1.0E-05
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1740	6.2E-05	1.9E-03	1.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener	1070	9.0E-04	2.7E-02	1.6E-05
MLLW	200 ERDF Site	Resident Gardener	1070	8.6E-05	2.6E-03	1.5E-06
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1740	2.3E-04	6.9E-03	4.1E-06
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1070	4.0E-03	1.2E-01	7.2E-05
MLLW	200 ERDF Site	Resident Gardener + Sauna	1070	4.1E-04	1.2E-02	7.3E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.132.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>3</sub>,  
 3      Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.4E-06	7.2E-05	4.3E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	6.7E-06	2.0E-04	1.2E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1660	4.6E-06	1.4E-04	8.4E-08
LLW Cat 3	200 ERDF Site	Resident Gardener	1520	7.7E-05	2.3E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	1650	7.9E-05	2.4E-03	1.4E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	820	7.5E-07	2.2E-05	1.3E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1660	1.7E-05	5.1E-04	3.1E-07
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	1650	2.1E-04	6.2E-03	3.7E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	820	3.9E-06	1.2E-04	7.0E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.133.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>3</sub>,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	2.9E-06	8.7E-05	5.2E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	3.0E-05	9.1E-04	5.4E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.1E-06	2.4E-04	1.5E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	8.1E-05	2.4E-03	1.5E-06
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1660	5.7E-06	1.7E-04	1.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1420	7.8E-05	2.4E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	1650	7.9E-05	2.4E-03	1.4E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	940	1.2E-06	3.7E-05	2.2E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1660	2.1E-05	6.3E-04	3.8E-07
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	1650	2.1E-04	6.2E-03	3.7E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	940	6.2E-06	1.9E-04	1.1E-07

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.134.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – Alternative Group E<sub>3</sub>,  
 3      Upper Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.4E-08
	200 East Area	Resident Gardener	260	6.6E-06	2.0E-04	1.2E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	5.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	8.2E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	2.2E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	5.2E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	3.3E-08
	200 East Area	Resident Gardener + Sauna	10000	7.4E-05	2.2E-03	1.3E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.1E-05	6.4E-04	3.9E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.5E-08
	200 West Area	Resident Gardener + Sauna	600	3.1E-05	9.4E-04	5.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.5E-05	4.6E-04	2.8E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	2000	3.0E-06	9.1E-05	5.4E-08
LLW Cat 3	200 West Area	Resident Gardener	1710	1.7E-06	5.1E-05	3.0E-08
MLLW	200 West Area	Resident Gardener	2000	1.7E-05	5.2E-04	3.1E-07
	200 East Area	Resident Gardener	10000	8.1E-05	2.4E-03	1.5E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	2000	8.6E-06	2.6E-04	1.6E-07
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1710	8.0E-06	2.4E-04	1.4E-07
MLLW	200 West Area	Resident Gardener + Sauna	2000	5.2E-05	1.6E-03	9.4E-07
	200 East Area	Resident Gardener + Sauna	10000	7.0E-02	2.1E+00	1.3E-03
<b>Projected New Waste (&gt; 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 ERDF Site	Resident Gardener	1660	5.7E-06	1.7E-04	1.0E-07
LLW Cat 3	200 ERDF Site	Resident Gardener	1520	7.7E-05	2.3E-03	1.4E-06
MLLW	200 ERDF Site	Resident Gardener	1660	8.3E-05	2.5E-03	1.5E-06
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
Melters	200 East Area	Resident Gardener	820	7.5E-07	2.2E-05	1.3E-08
LLW Cat 1	200 ERDF Site	Resident Gardener + Sauna	1660	2.1E-05	6.3E-04	3.8E-07
LLW Cat 3	200 ERDF Site	Resident Gardener + Sauna	1420	3.5E-04	1.1E-02	6.3E-06
MLLW	200 ERDF Site	Resident Gardener + Sauna	1660	2.3E-04	6.8E-03	4.1E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05
Melters	200 East Area	Resident Gardener + Sauna	820	3.9E-06	1.2E-04	7.0E-08

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.135.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – No Action  
 3      Alternative, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.1E-06	6.4E-05	3.2E-08
	200 East Area	Resident Gardener	10000	8.7E-05	2.6E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.8E-06	2.6E-04	1.3E-07
	200 East Area	Resident Gardener + Sauna	10000	7.5E-02	2.3E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	4.5E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-03	4.9E-06
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	6.6E-08
	200 East Area	Resident Gardener + Sauna	10000	1.3E-03	3.8E-02	1.9E-05
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	9.4E-07
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	2.6E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.3E-03	1.6E-06
	200 East Area	Resident Gardener + Sauna	110	2.6E-02	7.8E-01	3.9E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	1220	1.9E-05	5.7E-04	3.4E-07
	200 East Area	Resident Gardener	1220	1.9E-05	5.7E-04	3.4E-07
LLW Cat 3	200 West Area	Resident Gardener	680	8.6E-04	2.6E-02	1.5E-05
	200 East Area	Resident Gardener	10000	6.6E-04	2.0E-02	1.2E-05
MLLW	200 West Area	Resident Gardener	1220	3.5E-05	1.1E-03	6.3E-07
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	1220	6.5E-05	1.9E-03	1.2E-06
	200 East Area	Resident Gardener + Sauna	10000	1.6E-03	4.7E-02	2.8E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	680	4.0E-03	1.2E-01	7.1E-05
	200 East Area	Resident Gardener + Sauna	10000	5.7E-01	1.7E+01	1.0E-02
MLLW	200 West Area	Resident Gardener + Sauna	1220	8.0E-05	2.4E-03	1.4E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of a LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

(c) Results are not reported for cases that had no inventory reported for the waste.

1      **Table F.136.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 East Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – No Action  
 3      Alternative, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	350	2.1E-06	6.4E-05	3.2E-08
	200 East Area	Resident Gardener	10000	8.7E-05	2.6E-03	1.3E-06
	200 West Area	Resident Gardener + Sauna	350	8.8E-06	2.6E-04	1.3E-07
	200 East Area	Resident Gardener + Sauna	10000	7.5E-02	2.3E+00	1.1E-03
1970 – 1988	200 West Area	Resident Gardener	420	3.0E-06	9.1E-05	4.5E-08
	200 East Area	Resident Gardener	110	3.2E-04	9.7E-03	4.9E-06
	200 West Area	Resident Gardener + Sauna	420	4.4E-06	1.3E-04	6.6E-08
	200 East Area	Resident Gardener + Sauna	10000	1.3E-03	3.8E-02	1.9E-05
1988 – 1995	200 West Area	Resident Gardener	360	6.2E-05	1.9E-03	9.4E-07
	200 East Area	Resident Gardener	110	1.7E-02	5.2E-01	2.6E-04
	200 West Area	Resident Gardener + Sauna	360	1.1E-04	3.3E-03	1.6E-06
	200 East Area	Resident Gardener + Sauna	110	2.6E-02	7.8E-01	3.9E-04
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	360	2.9E-05	8.8E-04	5.3E-07
	200 East Area	Resident Gardener	110	1.1E-05	3.2E-04	1.9E-07
LLW Cat 3	200 West Area	Resident Gardener	1460	1.7E-04	5.0E-03	3.0E-06
	200 East Area	Resident Gardener	10000	7.1E-04	2.1E-02	1.3E-05
MLLW	200 West Area	Resident Gardener	1220	3.5E-05	1.1E-03	6.4E-07
ILAW	200 East Area	Resident Gardener	10000	1.0E-04	3.0E-03	1.8E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	360	1.0E-04	3.0E-03	1.8E-06
	200 East Area	Resident Gardener + Sauna	10000	1.9E-03	5.8E-02	3.5E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1460	7.4E-04	2.2E-02	1.3E-05
	200 East Area	Resident Gardener + Sauna	10000	5.9E-01	1.8E+01	1.1E-02
MLLW	200 West Area	Resident Gardener + Sauna	1220	8.0E-05	2.4E-03	1.4E-06
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.5E-02	1.0E-00	6.0E-04

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.  
 (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.  
 (c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.137.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – No Action  
 3      Alternative, Hanford Only Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	1.8E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	7.5E-07
1970 – 1988	200 West Area	Resident Gardener	250	2.4E-05	7.3E-04	3.7E-07
	200 West Area	Resident Gardener + Sauna	250	3.6E-05	1.1E-03	5.4E-07
1988 – 1995	200 West Area	Resident Gardener	210	5.2E-04	1.6E-02	7.8E-06
	200 West Area	Resident Gardener + Sauna	210	9.0E-04	2.7E-02	1.4E-05
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	210	2.0E-04	6.0E-03	3.6E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
MLLW	200 West Area	Resident Gardener	1070	2.3E-04	7.0E-03	4.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	210	6.8E-04	2.0E-02	1.2E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.2E-03	1.6E-01	9.4E-05
MLLW	200 West Area	Resident Gardener + Sauna	1070	5.2E-04	1.6E-02	9.4E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

1      **Table F.138.** Potential Individual Human Health Impacts to a Resident Gardener at the 200 West Area  
 2      Point of Analysis from Radionuclides in the Groundwater Over 10,000 Years – No Action  
 3      Alternative, Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	190	1.2E-05	3.6E-04	1.8E-07
	200 West Area	Resident Gardener + Sauna	190	5.0E-05	1.5E-03	7.5E-07
1970 – 1988	200 West Area	Resident Gardener	250	2.4E-05	7.3E-04	3.7E-07
	200 West Area	Resident Gardener + Sauna	250	3.6E-05	1.1E-03	5.4E-07
1988 – 1995	200 West Area	Resident Gardener	210	5.2E-04	1.6E-02	7.8E-06
	200 West Area	Resident Gardener + Sauna	210	9.0E-04	2.7E-02	1.4E-05
<b>Newly Generated Waste (1996 – 2007)</b>						
LLW Cat 1	200 West Area	Resident Gardener	210	2.4E-04	7.3E-03	4.4E-06
LLW Cat 3	200 West Area	Resident Gardener	1230	1.2E-03	3.5E-02	2.1E-05
MLLW	200 West Area	Resident Gardener	1070	2.3E-04	7.0E-03	4.2E-06
LLW Cat 1	200 West Area	Resident Gardener + Sauna	210	8.3E-04	2.5E-02	1.5E-05
LLW Cat 3	200 West Area	Resident Gardener + Sauna	1230	5.2E-03	1.6E-01	9.4E-05
MLLW	200 West Area	Resident Gardener + Sauna	1070	5.2E-04	1.6E-02	9.4E-06

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.

(b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.

1      **Table F.139.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – No Action Alternative,  
 3      Hanford Only Volumes

4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.1E-08
	200 East Area	Resident Gardener	260	6.7E-06	2.0E-04	1.0E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	4.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	6.8E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	1.9E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	4.3E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	2.7E-08
	200 East Area	Resident Gardener + Sauna	10000	7.3E-05	2.2E-03	1.1E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.3E-05	7.0E-04	3.5E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.1E-08
	200 West Area	Resident Gardener + Sauna	10000	4.9E-02	1.5E+00	7.3E-04
	200 East Area	Resident Gardener + Sauna	10000	6.5E-04	0.0E+00	0.0E+00
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	600	8.4E-06	2.5E-04	1.5E-07
	200 East Area	Resident Gardener	260	7.7E-07	2.3E-05	1.4E-08
LLW Cat 3	200 West Area	Resident Gardener	930	1.1E-04	3.3E-03	2.0E-06
	200 East Area	Resident Gardener	10000	3.1E-05	9.4E-04	5.6E-07
MLLW	200 West Area	Resident Gardener	1420	1.4E-05	4.3E-04	2.6E-07
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	600	3.0E-05	9.0E-04	5.4E-07
	200 East Area	Resident Gardener + Sauna	10000	9.5E-05	2.8E-03	1.7E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	940	4.9E-04	1.5E-02	8.8E-06
	200 East Area	Resident Gardener + Sauna	10000	2.3E-02	6.9E-01	4.2E-04
MLLW	200 West Area	Resident Gardener + Sauna	1420	3.2E-05	9.7E-04	5.8E-07
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.  
 (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.  
 (c) Results are not reported for cases that had no inventory reported for the waste.

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1      **Table F.140.** Potential Individual Human Health Impacts to a Resident Gardener at the Columbia River  
 2      Well from Radionuclides in the Groundwater Over 10,000 Years – No Action Alternative,  
 3      Lower Bound Volumes  
 4

Waste Category	Source Location	Exposure Scenario	Maximum Annual Dose		Lifetime Dose, rem	Probability of an LCF <sup>(b)</sup>
			Years Post-2046 <sup>(a)</sup>	Dose, rem		
<b>Previously Disposed Low Level Waste</b>						
Pre-1970	200 West Area	Resident Gardener	530	7.6E-07	2.3E-05	1.1E-08
	200 East Area	Resident Gardener	260	6.7E-06	2.0E-04	1.0E-07
	200 West Area	Resident Gardener + Sauna	530	3.1E-06	9.4E-05	4.7E-08
	200 East Area	Resident Gardener + Sauna	10000	4.5E-03	1.4E-01	6.8E-05
1970 – 1988	200 West Area	Resident Gardener	610	1.2E-06	3.7E-05	1.9E-08
	200 East Area	Resident Gardener	260	2.9E-05	8.7E-04	4.3E-07
	200 West Area	Resident Gardener + Sauna	610	1.8E-06	5.5E-05	2.7E-08
	200 East Area	Resident Gardener + Sauna	10000	7.3E-05	2.2E-03	1.1E-06
1988 – 1995	200 West Area	Resident Gardener	600	2.3E-05	7.0E-04	3.5E-07
	200 East Area	Resident Gardener	260	1.4E-06	4.2E-05	2.1E-08
	200 West Area	Resident Gardener + Sauna	10000	4.9E-02	1.5E+00	7.3E-04
	200 East Area	Resident Gardener + Sauna	10000	2.2E-05	6.5E-04	3.3E-07
<b>Newly Generated Waste (1996 – 2007)<sup>(c)</sup></b>						
LLW Cat 1	200 West Area	Resident Gardener	600	1.0E-05	3.1E-04	1.9E-07
	200 East Area	Resident Gardener	260	9.4E-07	2.8E-05	1.7E-08
LLW Cat 3	200 West Area	Resident Gardener	930	1.1E-04	3.3E-03	2.0E-06
	200 East Area	Resident Gardener	10000	2.9E-05	8.6E-04	5.2E-07
MLLW	200 West Area	Resident Gardener	1420	1.4E-05	4.3E-04	2.6E-07
ILAW	200 East Area	Resident Gardener	10000	1.3E-05	3.8E-04	2.3E-07
LLW Cat 1	200 West Area	Resident Gardener + Sauna	600	3.6E-05	1.1E-03	6.6E-07
	200 East Area	Resident Gardener + Sauna	10000	1.1E-04	3.4E-03	2.0E-06
LLW Cat 3	200 West Area	Resident Gardener + Sauna	940	4.9E-04	1.5E-02	8.8E-06
	200 East Area	Resident Gardener + Sauna	10000	2.4E-02	7.2E-01	4.3E-04
MLLW	200 West Area	Resident Gardener + Sauna	1420	3.2E-05	9.7E-04	5.8E-07
ILAW	200 East Area	Resident Gardener + Sauna	10000	3.3E-05	9.8E-02	5.9E-05

(a) The number of years post-2046 in which the maximum annual dose occurs over the 10,000-yr period.  
 (b) Health impacts are expressed as lifetime risk of fatal cancer from the indicated lifetime radiation dose. The probability of an LCF is the calculated value using the appropriate linear health effects conversion factor. The actual probability cannot be greater than one.  
 (c) Results are not reported for cases that had no inventory reported for the waste.

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