

1 The maximum credible accident postulated here is assumed to involve a severe impact followed by a
2 fire. The impact condition is assumed to break up the waste form and cause the waste container to fail so
3 the contained material has an open pathway to the environment. A fire is then assumed to occur, resulting
4 in additional damage and turning the waste material into an aerosol. The aerosol and respirable fractions,
5 used for the radiological materials (for example, with LLW Category 1), were set equal to 0.1 and 0.05,
6 respectively, and were also used to characterize the released hazardous chemicals. Therefore, a combined
7 respirable release fraction of 0.005 was used in the calculations.
8

9 Because an accident could occur anywhere and at any time during a shipment, predicting the popu-
10 lation distributions and weather conditions at the time of the accident is not possible. For this analysis,
11 the concentrations of the hazardous materials at the location of the maximally exposed individual were
12 calculated. The maximally exposed individual (MEI) for onsite shipments was assumed to be a Hanford
13 Site worker located 100 m (109 yd) downwind from the accident location for the entire duration of the
14 release. The dose to the MEI for offsite shipments would be similar. Downwind air concentrations are
15 also a function of wind speed and atmospheric stability class. Accident-analysis guidance from the
16 U.S. Nuclear Regulatory Commission (NRC) was used to characterize the weather conditions at the time
17 of the accident. The wind speed was assumed to be 1 m/s, and Pasquill stability class F (stable condi-
18 tions) was assumed. These are low-probability wind conditions that tend to overestimate typical concen-
19 trations of released materials. The atmospheric dispersion coefficient or E/Q was calculated using NRC
20 Regulatory Guide 1.145 (NRC 1982). The atmospheric dispersion coefficient at 100 m (109 yd) under
21 Pasquill stability class F and 1 m/s wind speed was calculated to be $3.5E-2 \text{ s/m}^3$.
22

23 The impacts to the maximum exposed individual were determined by comparing the downwind
24 concentrations of each hazardous chemical to safe exposure levels. The primary source of the exposure
25 levels is Craig (2001), *ERPGs and TEELs for Chemicals of Concern, Rev. 18*. The safe exposure level
26 assumed here is the TEEL-2 (Temporary Emergency Exposure Limit - 2), as defined by Craig (2001).
27 The TEEL-2 concentration is defined as the maximum concentration in air below which nearly all
28 individuals could be exposed without experiencing or developing irreversible or other serious health
29 effects or symptoms that could impair their abilities to take protective action.
30

31 **H.2 Results of Transportation-Impact Analysis**

32

33 This section presents the results of the transportation-impact analysis in support of the EIS. Separate
34 subsections are presented for results of Alternative Groups A through E and the No Action Alternative.
35 The accident-impact analysis results for hazardous chemicals are presented in Section H.6. All of the
36 impacts provided in the table are in fatalities except for the estimated number of traffic accidents.
37 Fatalities are expressed in latent cancer fatalities (LCFs) for radiological impacts and routine non-
38 radiological emissions. For non-radiological accidents, impacts are expressed in terms of the predicted
39 number of traffic accidents and physical-trauma-induced fatalities resulting from the traffic accidents.
40 Note that many of the entries in the table are expressed as fractional fatalities, for example, 1E-1 or
41 0.1 fatalities. The whole-number totals are determined by summing over all waste types and then
42 rounding the sums to the nearest whole number.
43

1 **H.2.1 Alternative Group A**

2
3 The transportation impacts for Alternative Group A, Hanford Only volume is presented in Table H.7.
4 The impacts of shipments from offsite generators, which make up the differences between the Hanford
5 Only, Lower Bound, and Upper Bound waste-volume cases, are addressed in Section H.5.
6

7 **H.2.2 Alternative Group B**

8
9 Table H.8 presents the impacts of transporting MLLW under Alternative Group B, Hanford Only
10 waste volume. Note that the shipping parameters for transportation of LLW, TRU waste, and ILAW are
11 the same in this alternative as they are in Alternative Group A. Thus, only the MLLW impacts are
12 presented in Table H.8. Also note that the impacts of shipments from offsite generators, which make up
13 the differences between the Hanford Only, Lower Bound, and Upper Bound waste-volume cases, are
14 addressed in Section H.5.

15 **H.2.3 Alternative Group C**

16
17 The results of the impact analysis for transport of solid waste under the Alternative Group C are the
18 same as those for Alternative Group A because there are no substantial differences in shipping param-
19 eters. Treatment and disposal facilities are located in the same areas of the Hanford Site in both alter-
20 natives. Since most of these wastes were assumed to be transported from the 300 Area to 200 Area
21 disposal facilities to bound the impacts, the exact locations of the disposal facilities have little impact on
22 the results.
23

24 **H.2.4 Alternative Group D**

25
26 The results of the impact analysis for transport of solid waste under the Alternative Group D are the
27 same as those for Alternative Group A because there are no substantial differences in shipping param-
28 eters. See Section H.2.3.

29 **H.2.5 Alternative Group E**

30
31 The results of the impact analysis for transport of solid waste under the Alternative Group E are the
32 same as those for Alternative Group A because there are no substantial differences in shipping param-
33 eters. See Section H.2.3.
34

35 **H.2.6 No Action Alternative**

36
37 Table H.9 presents the transportation impacts of the No Action Alternative.
38
39

1 **Table H.7.** Transportation Impacts of Alternative Group A, Hanford Only Waste Volume^(a), Number
 2 of Fatalities
 3

Waste Stream	Radiological Incident-Free LCFs		Radiological Accident LCFs	Non-radiological Accidents		
	Occupational	Non-Occupational		Number of Accidents	Number of Fatalities	Emissions LCFs
LLW						
WRAP						
1b - LLW Cat. 1	6.3E-04	5.3E-04	2.1E-05	4.0E-03	4.4E-04	3.5E-03
2c - LLW Cat. 3	6.1E-04	5.2E-04	7.2E-04	3.9E-03	4.3E-04	3.4E-03
T Plant Complex						
1b2 - LLW Cat. 1	6.0E-06	1.2E-05	8.3E-07	1.3E-05	1.5E-06	1.2E-05
2c2 - LLW Cat. 3	6.9E-06	1.4E-05	3.6E-05	1.5E-05	1.7E-06	1.3E-05
Offsite Commercial Facilities	2.4E-05	4.8E-05	5.3E-10	4.4E-04	4.8E-05	3.8E-04
Repackage in HICs or Trench Grouting						
2a - LLW Cat 3 Direct Disposal	1.5E-02	1.2E-02	1.7E-02	9.5E-02	1.0E-02	8.2E-02
2c1 - LLW Cat 3 from WRAP	6.4E-05	1.3E-04	3.3E-04	1.4E-04	1.6E-05	1.2E-04
2c2 - LLW Cat 3 from T Plant	1.0E-05	2.1E-05	5.4E-05	2.3E-05	2.5E-06	2.0E-05
LLBG						
1a - LLW Cat 1 Direct Disposal	1.3E-02	1.1E-02	4.2E-04	8.1E-02	8.9E-03	7.0E-02
1a - LLW Cat 1 from stream 11	3.0E-05	2.5E-05	9.9E-07	1.9E-04	2.1E-05	1.7E-04
1b1 - LLW Cat 1 from WRAP	6.7E-05	1.4E-04	9.2E-06	1.5E-04	1.6E-05	1.3E-04
1b2 - LLW Cat 1 from T Plant	9.0E-06	1.8E-05	1.2E-06	2.0E-05	2.2E-06	1.7E-05
6 - Non-Conforming LLW	4.8E-05	9.6E-05	1.1E-09	8.7E-04	9.6E-05	7.6E-04
TOTAL LLW	2.9E-02	2.5E-02	1.9E-02	1.9E-01	2.0E-02	1.6E-01
MLLW						
WRAP						
11 - Wastes ready for disposal	7.8E-05	6.6E-05	2.6E-06	5.0E-04	5.5E-05	4.4E-04
13 - Waste verification	1.3E-04	2.6E-04	1.8E-05	2.9E-04	3.2E-05	2.5E-04
13 - Post treatment verification	1.3E-04	2.7E-04	1.8E-05	2.9E-04	3.2E-05	2.5E-04
MLLW reclassified as LLW	8.7E-07	1.8E-06	1.2E-07	1.9E-06	2.1E-07	1.7E-06
Modified T Plant						
12 - RH MLLW	7.8E-04	1.5E-03	1.1E-03	1.7E-03	1.9E-04	1.5E-03
Commercial Treatment Facilities						
13A - CH Standard (non-thermal)	2.3E-01	5.5E-02	2.1E-07	1.2E+01	2.8E-01	1.2E-02
13B - CH Standard (thermal)	7.7E-02	1.9E-02	6.9E-08	3.9E+00	9.5E-02	3.9E-03
14 - Elemental Lead	0	0	0	1.3E-02	1.4E-03	1.1E-02
15 - Elemental Mercury	0	0	0	4.6E-04	5.0E-05	4.0E-04

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Table H7. (contd)

Waste Stream	Radiological Incident-Free LCFs		Radiological Accident LCFs	Non-radiological Accidents		
	Occupational	Non-Occupational		Number of Accidents	Number of Fatalities	Emissions LCFs
MW Enhanced Trench Design						
11 - Wastes ready for disposal	1.1E-02	9.4E-03	3.7E-04	7.2E-02	7.8E-03	6.2E-02
22 - WTP Melters	3.0E-05	5.9E-05	4.2E-05	6.7E-06	7.3E-07	5.8E-06
11 - From WRAP verification	9.1E-06	1.8E-05	1.3E-06	2.0E-05	2.2E-06	1.7E-05
12 - RH MLLW from Modified T Plant	1.1E-03	2.2E-03	1.5E-03	2.5E-03	2.7E-04	2.1E-03
13A - CH Standard (non-thermal)	9.2E-03	8.1E-03	3.2E-04	6.1E-02	6.7E-03	5.3E-02
13B - CH Standard (thermal)	7.7E-02	1.9E-02	6.9E-08	3.9E+00	9.5E-02	3.9E-03
14 - Elemental Lead	0	0	0	2.6E-02	2.9E-03	2.3E-02
15 - Elemental Mercury	0	0	0	9.2E-04	1.0E-04	8.0E-04
TOTAL MLLW	4.1E-01	1.1E-01	3.4E-03	2.0E+01	4.9E-01	1.7E-01
TRU						
WRAP						
4A - Retrievably Stored Drums in Trenches	1.8E-04	3.5E-04	3.5E-04	4.0E-04	4.4E-05	3.5E-04
9 - Drums	2.5E-03	2.1E-03	1.2E-03	1.6E-02	1.7E-03	1.4E-02
9 - SWBs	5.2E-03	4.4E-03	2.5E-03	3.3E-02	3.7E-03	2.9E-02
Storage in T Plant Complex						
#17 - K-Basin Sludge	4.9E-05	3.2E-05	2.3E-06	1.1E-04	1.2E-05	9.7E-05
WIPP						
LLBG	See Section H.5					
4A - TRU drums assayed in trench as LLW						
4A - Empty containers sent to LLBG for disposal	8.2E-06	1.7E-05	1.1E-06	1.8E-05	2.0E-06	1.6E-05
9 - drums assayed in WRAP as LLW	6.7E-06	1.4E-05	9.3E-07	1.5E-05	1.6E-06	1.3E-05
10A - Newly generated CH Non-standard	2.4E-05	4.7E-05	3.3E-06	5.3E-05	5.8E-06	4.6E-05
10B - Newly-generated RH Waste	5.8E-04	1.1E-03	8.0E-04	1.3E-03	1.4E-04	1.1E-03
10 - TRU Waste Processed at T-Plant	4.7E-06	9.6E-06	6.5E-07	1.0E-05	1.1E-06	9.1E-06
TOTAL TRU WASTE	8.6E-03	8.1E-03	4.9E-03	5.1E-02	5.6E-03	4.5E-02
ILAW						
Immobilized Low Activity Waste	5.8E-03	1.9E-04	3.7E-11	3.5E-02	3.8E-03	3.0E-03
GRAND TOTAL	4.5E-01	1.5E-01	2.7E-02	2.0E+01	5.2E-01	3.8E-01

3

1 **Table H.8.** MLLW^(a) Transportation Impacts of Alternative Group B, Hanford Only Waste Volume,
 2 Number of Fatalities
 3

Waste Stream	Radiological Impacts, LCFs		Radiological Accidents	Non-Radiological Impacts		
	Occupational	Non-Occupational		Number of Accidents	Accident Fatalities	Emission, LCFs s
MLLW						
WRAP						
11 - Wastes ready for disposal	7.8E-05	6.6E-05	2.6E-06	5.0E-04	5.5E-05	4.4E-04
13 - Waste verification	1.3E-04	2.6E-04	1.8E-05	2.9E-04	3.2E-05	2.5E-04
13 - Post treatment verification	1.3E-04	2.7E-04	1.8E-05	2.9E-04	3.2E-05	2.5E-04
MLLW reclassified as LLW	8.7E-07	1.8E-06	1.2E-07	1.9E-06	2.1E-07	1.7E-06
Modified T Plant						
12 - RH MLLW	7.8E-04	1.5E-03	1.1E-03	1.7E-03	1.9E-04	1.5E-03
Commercial Treatment Facilities						
13A - CH Standard (non-thermal)	1.3E-03	2.5E-03	1.8E-04	2.8E-03	3.1E-04	2.5E-03
13B - CH Standard (thermal)	4.1E-03	1.0E-03	3.7E-09	2.1E-01	5.1E-03	2.1E-04
14 - Elemental Lead	0	0	0	2.7E-04	3.0E-05	2.4E-04
15 - Elemental Mercury	0	0	0	9.6E-06	1.1E-06	8.3E-06
MW Enhanced Trench Design						
11 - Wastes ready for disposal	1.1E-02	9.4E-03	3.7E-04	7.2E-02	7.8E-03	6.2E-02
22 - WTP Melters	3.0E-05	5.9E-05	4.2E-05	6.7E-06	7.3E-07	5.8E-06
11 - From WRAP verification	9.1E-06	1.8E-05	1.3E-06	2.0E-05	2.2E-06	1.7E-05
12 - RH MLLW from Modified T Plant	1.1E-03	2.2E-03	1.5E-03	2.5E-03	2.7E-04	2.1E-03
13A - CH Standard (non-thermal)	2.3E-03	4.4E-03	3.1E-04	5.0E-03	5.5E-04	4.3E-03
13B - CH Standard (thermal)	4.1E-03	1.0E-03	3.7E-09	2.1E-01	5.1E-03	2.1E-04
14 - Elemental Lead	0	0	0	5.5E-04	6.0E-05	4.8E-04
15 - Elemental Mercury	0	0	0	1.4E-04	1.6E-05	1.2E-04
TOTAL MLLW	2.5E-02	2.3E-02	3.6E-03	5.1E-01	2.0E-02	7.5E-02

4

1 **Table H.9.** Transportation Impacts for the No Action Alternative^(a), Hanford-only Waste Volume,
 2 Number of Fatalities
 3

Waste Type	Radiological Incident-Free Impacts, LCFs		Radio-Logical Accidents LCFs	Non-radiological		
	Occupational	Non-Occupational		Number of Accidents	Accident Fatalities	Emissions, LCFs
LLW						
WRAP						
1b - LLW Cat. 1	6.3E-04	5.3E-04	2.1E-05	4.0E-03	4.4E-04	3.5E-03
2c - LLW Cat. 3	6.1E-04	5.2E-04	7.2E-04	3.9E-03	4.3E-04	3.4E-03
T-Plant Complex						
1b2 - LLW Cat. 1	6.0E-06	1.2E-05	8.3E-07	1.3E-05	1.5E-06	1.2E-05
2c2 - LLW Cat. 3	6.9E-06	1.4E-05	3.6E-05	1.5E-05	1.7E-06	1.3E-05
Repackage in HICs or Trench Grouting						
2a - LLW Cat 3 Direct Disposal	1.5E-02	1.2E-02	1.7E-02	9.5E-02	1.0E-02	8.2E-02
2c1 - LLW Cat 3 from WRAP	6.4E-05	1.3E-04	3.3E-04	1.4E-04	1.6E-05	1.2E-04
2c2 - LLW Cat 3 from T Plant	1.0E-05	2.1E-05	5.4E-05	2.3E-05	2.5E-06	2.0E-05
LLBG						
1a - LLW Cat 1 Direct Disposal	1.3E-02	1.1E-02	4.2E-04	8.1E-02	8.9E-03	7.0E-02
1a - LLW Cat 1 from stream 11	3.0E-05	2.5E-05	9.8E-07	1.9E-04	2.1E-05	1.7E-04
1b1 - LLW Cat 1 from WRAP	6.7E-05	1.4E-04	9.2E-06	1.5E-04	1.6E-05	1.3E-04
1b2 - LLW Cat 1 from T Plant	9.0E-06	1.8E-05	1.2E-06	2.0E-05	2.2E-06	1.7E-05
TOTAL LLW	2.9E-02	2.5E-02	1.9E-02	1.8E-01	2.0E-02	1.6E-01
MLLW						
WRAP						
11 - Wastes ready for disposal	7.8E-05	6.6E-05	2.6E-06	5.0E-04	5.5E-05	4.3E-04
13 - Waste verification	1.3E-04	2.6E-04	1.8E-05	2.9E-04	3.2E-05	2.5E-04
13 - Post treatment verification	1.7E-06	3.6E-06	2.4E-07	3.9E-06	4.2E-07	3.4E-06
MLLW reclassified as LLW	8.5E-07	1.7E-06	1.2E-07	1.9E-06	2.1E-07	1.6E-06
Commercial Treatment Facilities						
13B - CH Standard (thermal)	1.3E-02	2.5E-03	9.4E-09	4.5E-01	1.1E-02	4.5E-04
MW Existing Trenches						
11 - Wastes ready for disposal	1.1E-02	9.2E-03	3.6E-04	7.0E-02	7.6E-03	6.0E-02
11 - From WRAP verification	5.5E-06	1.1E-05	7.6E-07	1.2E-05	1.3E-06	1.1E-05
13B - CH Standard (thermal)	1.3E-02	2.5E-03	9.4E-09	4.5E-01	1.1E-02	4.5E-04
14 - Elemental Lead	0	0	0	2.8E-03	3.1E-04	2.5E-03

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Table H9. (contd)

Waste Type	Radiological Incident-Free Impacts, LCFs		Radio-Logical Accidents LCFs	Non-radiological		
	Occupational	Non-Occupational		Number of Accidents	Accident Fatalities	Emissions, LCFs
15 - Elemental Mercury	0	0	0	1.5E-04	1.6E-05	1.3E-04
TOTAL MLLW	3.7E-02	1.5E-02	3.8E-04	9.6E-01	2.9E-02	6.5E-02
TRU						
WRAP						
4A - Retrievably Stored Drums in Trenches	1.8E-04	3.5E-04	3.5E-04	4.0E-04	4.4E-05	3.5E-04
9 - CH - Standard Containers (55-gal drums and SWBs)						
Drums	2.5E-03	2.1E-03	1.2E-03	1.6E-02	1.7E-03	1.4E-02
SWBs	5.2E-03	4.4E-03	2.5E-03	3.3E-02	3.7E-03	2.9E-02
Storage in T Plant Complex						
17 - K-Basin Sludge	4.9E-05	3.2E-05	2.3E-06	1.1E-04	1.2E-05	9.7E-05
WIPP	See Section H.5					
LLBG						
4A - Empty containers sent to LLBG for disposal	8.2E-06	1.7E-05	1.1E-06	1.8E-05	2.0E-06	1.6E-05
9 - drums assayed in WRAP as LLW	6.7E-06	1.4E-05	9.3E-07	1.5E-05	1.6E-06	1.3E-05
10A - Newly generated CH Non-standard	2.4E-05	4.7E-05	3.3E-06	5.3E-05	5.8E-06	4.6E-05
10B - Newly-generated RH Waste	5.8E-04	1.1E-03	8.0E-04	1.3E-03	1.4E-04	1.1E-03
TOTAL TRU WASTE	8.6E-03	8.1E-03	4.9E-03	5.1E-02	5.6E-03	4.5E-02
ILAW	Inter-facility transfer					
GRAND TOTAL	7.5E-02	4.7E-02	2.4E-02	1.2E+00	5.5E-02	2.7E-01

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H.2.6 Summary of Impacts

Table H.10 summarizes the radiological and non-radiological impacts of each Alternative Group. The results in the table indicate that Alternative Group B results in the lowest transportation impacts of all the alternatives. This is because most MLLW is treated onsite in this alternative so there are fewer offsite shipments of MLLW in Alternative Group B than were projected in the other Alternative Groups. Note that none of the alternatives is projected to result in any radiological fatalities. Only Alternative Group B is projected to result in a non-radiological fatality due to a traffic accident (recall that Group B includes

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Table H.10. Summary of Impacts of Shipping Hanford Only Wastes for Each Alternative Group^(a)

Waste Type	Radiological Impacts, LCFs			Non-Radiological Impacts		
	Occupational	Non-Occupational	Radiological Accidents	Number of Accidents	Accident Fatalities	Emissions, LCFs
Alternative Groups A, C, D, and E^(b)						
LLW	2.9E-2	2.5E-2	1.9E-2	1.9E-1	2.0E-2	1.6E-1
MLLW	4.1E-1	1.1E-1	3.4E-3	2.0E+1	4.9E-1	1.7E-1
TRU Waste	8.0E-3	6.9E-3	4.1E-3	5.0E-2	5.5E-3	4.3E-2
ILAW	5.8E-3	1.9E-4	3.7E-11	3.5E-2	3.8E-3	3.0E-3
Total	0 (4.5E-1)	0 (1.5E-1)	0 (2.7E-2)	20 (2.0E+1)	1 (5.2E-1)	0 (3.8E-1)
Alternative Group B^(b)						
LLW	2.9E-2	2.5E-2	1.9E-2	1.9E-1	2.0E-2	1.6E-1
MLLW	2.5E-2	2.3E-2	3.6E-3	5.1E-1	2.0E-2	7.5E-2
TRU Waste	8.0E-3	6.9E-3	4.1E-3	5.0E-2	5.5E-3	4.3E-2
ILAW	5.8E-3	1.9E-4	3.7E-11	3.5E-2	3.8E-3	3.0E-3
Total	0 (6.9E-2)	0 (5.6E-2)	0 (2.7E-2)	1 (7.8E-1)	0 (4.9E-2)	0 (2.8E-1)
No Action Alternative						
LLW	2.9E-2	2.5E-2	1.9E-2	1.8E-1	2.0E-2	1.6E-1
MLLW	3.7E-2	1.5E-2	3.8E-4	9.6E-1	2.9E-2	6.5E-2
TRU Waste	8.6E-3	8.1E-3	4.9E-3	5.1E-2	5.6E-3	4.5E-2
Total^(c)	0 (7.5E-2)	0 (4.7E-2)	0 (2.4E-2)	1 (1.2E+0)	0 (5.5E-2)	0 (2.7E-1)
<p>Note: Public includes non-involved workers.</p> <p>(a) Radiological impacts (incident-free and accident) are expressed in units of LCFs. Non-radiological accident impacts are expressed as the expected number of accidents and the resulting physical trauma fatalities. Non-radiological emissions impacts are expressed as LCFs.</p> <p>(b) The impacts in these areas are for the Hanford Only waste volume case. Impacts are included for shipments of MLLW to offsite treatment facilities and back. The impacts in Washington and Oregon from offsite shipments are presented in Table 5.16.</p> <p>(c) No transportation impacts are included for transfer of ILAW cullet between the WTP and the adjacent grout vault used for ILAW disposal because of their close proximity.</p>						

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offsite shipments of MLLW to the ORR for treatment and then return of the treated waste to Hanford). Even so, the differences in impacts among the alternatives are small.

H.3 Impacts of Transporting Construction and Capping Materials

This section evaluates the impacts of transporting materials required to construct new facilities, such as new disposal trenches and treatment facilities, as well as materials required to cap the disposal facilities after they are filled with waste. The quantities of these materials, which include concrete, asphalt, basalt, and concrete, are compiled for each alternative in Section 5.10. This section evaluates the impacts of