4.3.4 Offsite Impacts (No Action Alternative)

Under the No Action Alternative, 4,060 cubic meters (145,000 cubic feet) of Class A LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP Class A LLW were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 4.8×10^{-3} to 5.4×10^{-3}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 6.9×10^{-6} and 3×10^{-16}. Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

4.4 IMPACTS OF ALTERNATIVE A – OFFSITE SHIPMENT OF HLW, LLW, MIXED LLW, AND TRU WASTE TO DISPOSAL

Under **Alternative A (Preferred Alternative)**, DOE would ship Class A, B, and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site (such as the Envirocare facility in Utah); ship TRU waste to WIPP in New Mexico; and ship HLW to the proposed Yucca Mountain HLW Repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste were determined to meet all the requirements for disposal in this repository. If some or all of WVDP's TRU waste did not meet these requirements, the Department would need to explore other alternatives for disposal of this waste.

Under DOE's current programmatic decisionmaking, offsite disposal of HLW would occur at the proposed Yucca Mountain HLW Repository sometime after 2025 assuming a license to operate is granted by NRC. Although this period would extend well beyond the 10 years required for all other proposed actions under this alternative, the impacts of transporting the HLW have been included in this EIS to fully inform the decisionmakers should an earlier opportunity to ship HLW present itself. The waste storage tanks would continue to be managed as described under the No Action Alternative.

4.4.1 Human Health Impacts (Alternative A)

This section characterizes the radiological impacts from Alternative A activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services.

Worker Impacts. Under Alternative A, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would continue as under current operations. Table 4-7 presents the radiological impacts to involved and noninvolved workers for Alternative A. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 61 person-rem or about 6.1 person-rem per year from activities under Alternative A. Over this same time period, the individual radiation dose to the average involved worker would be about 260 mrem per year. This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (1.3×10^{-4}) latent cancer fatality or a chance of about 1 in 7,700 per year.

In addition to radiation doses from Alternative A activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both Alternative A activities and ongoing operations, the total collective

Table 4-7. Radiation Doses for Involved and Noninvolved Workers Under Alternative A

Worker Population	Activity	Time Period (years)	Collective Dose: Annual (person-rem/yr)	Collective Dose: Total (person-rem)	Latent Cancer Fatalities: Annual	Latent Cancer Fatalities: Total
Involved workers[a]	Alternative A activities	10	6.1	61	3.1×10^{-3}	0.031
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	15	150	7.5×10^{-3}	0.075
All workers	Total	10	21	210	0.011	0.11

Worker Population	Activity	Time Period (years)	Individual Dose: Annual (mrem/yr)	Individual Dose: Total (mrem)	Latent Cancer Fatalities: Annual	Latent Cancer Fatalities: Total
Involved workers[a]	Alternative A activities	10	260	2,600	1.3×10^{-4}	1.3×10^{-3}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	59	590	3.0×10^{-5}	3.0×10^{-4}

a. Involved workers would be those individuals that actively participate in Alternative A.
b. Noninvolved workers would be those individuals that would be onsite but would not actively participate in Alternative A.

radiation dose to the workers was estimated to be about 210 person-rem over the duration of Alternative A or about 21 person-rem per year (Table 4-7). This dose is equivalent to less than 1 (0.11) latent cancer fatality within the worker population.

Nonradiological impacts to workers, based on Bureau of Labor Statistics and the required work effort estimated to complete the actions proposed under Alternative A, are not expected to result in any non-lost workday injuries, lost workday injuries, or fatalities.

Public Impacts. Under Alternative A, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would also continue as under current operations. Radiation doses to the public would be similar to the radiation doses for ongoing operations at the WVDP and thus would be the same as under the No Action Alternative (Table 4-8).

Annual Dose. The collective radiation dose through all exposure pathways (air and water) to people living within 80 kilometers (50 miles) of the site would be about 0.25 person-rem per year. This is equivalent to less than 1 (1.5×10^{-4}) latent cancer fatality in the exposed population each year. The radiation dose through all exposure pathways to the maximally exposed individual living around the WVDP site would be about 0.062 mrem per year. This radiation dose is 0.062 percent of the DOE standard of 100 mrem per year (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and would result in less than 1 (3.7×10^{-8}) latent cancer fatality per year or a chance of about 1 in 27 million for the maximally exposed individual.

Total Dose. For the duration of the Alternative A (10 years), the total collective radiation dose through all exposure pathways to the population around the WVDP site would be about 2.5 person-rem. This is equivalent to less than 1 (1.5×10^{-3}) latent cancer fatality for the duration of the alternative.

Table 4-8. Radiation Doses to the Public Under Alternative A[a]

Activity	Maximally Exposed Individual: Individual Radiation Dose[b] Annual (mrem/yr)	Individual Radiation Dose[b] Total (mrem)	Probability of Latent Cancer Fatality Annual	Probability of Latent Cancer Fatality Total	Population Around WVDP Site: Collective Radiation Dose[c] Annual (person-rem/yr)	Collective Radiation Dose[c] Total (person-rem)	Probability of Latent Cancer Fatality Annual	Probability of Latent Cancer Fatality Total
Ongoing operations at WVDP								
Airborne releases	0.021	0.21	1.3×10^{-8}	1.3×10^{-7}	0.17	1.7	1.0×10^{-4}	1.0×10^{-3}
Percent of EPA standard (10 mrem per year)	<1	NA[d]	NA	NA	NA	NA	NA	NA
Waterborne releases	0.041	0.41	2.5×10^{-8}	2.5×10^{-7}	0.083	0.83	5.0×10^{-5}	5.0×10^{-4}
All pathways	0.062	0.62	3.7×10^{-8}	3.7×10^{-7}	0.25	2.5	1.5×10^{-4}	1.5×10^{-3}
Percent of DOE standard (100 mrem per year)	<1	NA	NA	NA	NA	NA	NA	NA
Percent of natural background	<1	NA	NA	NA	<1	NA	NA	NA

a. The time period for Alternative A is 10 years.
b. Individual background radiation doses are about 300 mrem per year.
c. The collective radiation dose to the 1.5-million-person population that surrounds the WVDP site from natural background is about 380,000 person-rem per year.
d. NA = not applicable.

4.4.2 Impacts from Facility Accidents (Alternative A)

DOE evaluated the potential impacts that could occur as result of accidents at the WVDP site during the implementation of Alternative A. Because all waste types (Class A, B, C, LLW, mixed LLW, RH-TRU, CH-TRU, and HLW) would be shipped under Alternative A, accidents involving the handling of all waste types were evaluated. As with the No Action Alternative, accidents involving the ongoing management of Tanks 8D-1 and 8D-2 were evaluated. Accidents involving ongoing or continuing activities at the WVDP site that were not part of this EIS have been addressed in other documents such as the *Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley Final Environmental Impact Statement* (DOE 1982) and several facility safety analysis reports and environmental assessments. For example, accidents involving the High-Level Waste Vitrification Facility are characterized in the *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS 2000b).

One potential accident involved dropping two drums containing solidified Class C LLW from the Drum Cell. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 4.7×10^{-5} rem. This accident could result in a radiation dose of 1.6×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.050 person-rem; this is equivalent to a probability of a latent cancer fatality of 3.0×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 4.7×10^{-4} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

Table 4-9. Radiological Consequences of Accidents Using 50-Percent Atmospheric Conditions under Alternative A

Accident	Frequency (per year)	Worker Radiation Dose (rem)	Worker Latent Cancer Fatality	Maximally Exposed Individual Radiation Dose (rem)	Maximally Exposed Individual Latent Cancer Fatality	Population[a] Radiation Dose (person-rem)	Population[a] Latent Cancer Fatality
Drum cell drop	0.1 – 0.01	4.7×10^{-5}	2.4×10^{-8}	1.6×10^{-5}	9.6×10^{-9}	0.050	3.0×10^{-5}
Class C drum puncture[b]	0.1 – 0.01	1.2×10^{-4}	6.0×10^{-8}	3.9×10^{-5}	2.3×10^{-8}	0.12	7.2×10^{-5}
Class C pallet drop[b]	0.1 – 0.01	6.9×10^{-4}	3.5×10^{-7}	2.4×10^{-4}	1.4×10^{-7}	0.74	4.4×10^{-4}
Class C box puncture[b]	0.1 – 0.01	1.2×10^{-3}	6.0×10^{-7}	3.9×10^{-4}	2.3×10^{-7}	1.2	7.2×10^{-4}
HIC[c] drop	0.1 – 0.01	1.5×10^{-3}	7.5×10^{-7}	5.2×10^{-4}	3.1×10^{-7}	1.6	9.6×10^{-4}
CH-TRU drum puncture	0.1 – 0.01	0.038	1.9×10^{-5}	0.013	7.8×10^{-6}	41	0.025
RHWF[d] fire	$10^{-4} – 10^{-6}$	0.13	6.5×10^{-5}	0.044	2.6×10^{-5}	140	0.084
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	2.4×10^{-3}	1.2×10^{-6}	8.1×10^{-4}	4.9×10^{-7}	2.5	1.5×10^{-3}
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	2.8×10^{-3}	1.4×10^{-6}	9.5×10^{-4}	5.7×10^{-7}	3.0	1.8×10^{-3}

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.
c. HIC= High integrity container.
d. RHWF= Remote-Handled Waste Facility.

Table 4-10. Radiological Consequences of Accidents Using 95-Percent Atmospheric Conditions under Alternative A

Accident	Frequency (per year)	Worker Radiation Dose (rem)	Worker Latent Cancer Fatality	Maximally Exposed Individual Radiation Dose (rem)	Maximally Exposed Individual Latent Cancer Fatality	Population[a] Radiation Dose (person-rem)	Population[a] Latent Cancer Fatality
Drum cell drop	0.1 – 0.01	4.7×10^{-4}	2.4×10^{-7}	1.8×10^{-4}	1.1×10^{-7}	0.79	4.7×10^{-4}
Class C drum puncture[b]	0.1 – 0.01	1.2×10^{-3}	6.0×10^{-7}	4.3×10^{-4}	2.6×10^{-7}	1.9	1.1×10^{-3}
Class C pallet drop[b]	0.1 – 0.01	6.8×10^{-3}	3.4×10^{-6}	2.6×10^{-3}	1.6×10^{-6}	12	7.2×10^{-3}
Class C box puncture[b]	0.1 – 0.01	0.012	6.0×10^{-6}	4.3×10^{-3}	2.6×10^{-6}	19	0.011
HIC[c] drop	0.1 – 0.01	0.015	7.5×10^{-6}	5.6×10^{-3}	3.4×10^{-6}	25	0.015
CH-TRU drum puncture	0.1 – 0.01	0.38	1.9×10^{-4}	0.14	8.4×10^{-5}	630	0.38
RHWF[d] fire	$10^{-4} – 10^{-6}$	1.3	6.5×10^{-4}	0.47	2.8×10^{-4}	2,100	1.3
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	0.024	1.2×10^{-5}	8.9×10^{-3}	5.3×10^{-6}	39	0.023
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	0.028	1.4×10^{-5}	0.010	6.0×10^{-6}	46	0.028

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.
c. HIC= High integrity container.
d. RHWF= Remote-Handled Waste Facility.

A second potential accident involved the puncture of a drum containing Class C LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.2×10^{-4} rem. This accident could result in a radiation dose of 3.9×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.12 person-rem; this is equivalent to a probability of a latent cancer fatality of 7.2×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 1.1×10^{-3} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A third potential accident involved a drop of a pallet containing six Class C LLW drums, all of which were assumed to rupture. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 6.9×10^{-4} rem. This accident could result in a radiation dose of 2.4×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.74 person-rem; this is equivalent to a probability of a latent cancer fatality of 4.4×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 7.2×10^{-3} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A fourth potential accident involved the puncture of a box containing Class C LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.2×10^{-3} rem. This accident could result in a radiation dose of 3.9×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 1.2 person-rem; this is equivalent to a probability of a latent cancer fatality of 7.2×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.011 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A fifth potential accident involved dropping a high integrity container containing radioactive sludge and resin. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.5×10^{-3} rem. This accident could result in a radiation dose of 5.2×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 1.6 person-rem; this is equivalent to a probability of a latent cancer fatality of 9.6×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.015 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A sixth potential accident involved the puncture of a drum containing CH-TRU waste. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 0.038 rem. This accident could result in a radiation dose of 0.013 rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 41 person-rem; this is equivalent to a probability of a latent cancer fatality of 0.025. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.38 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A seventh potential accident involved a diesel fuel fire in the RHWF as a result of a leak in the fuel tank or fuel line of a truck. This fire would involve CH-TRU and RH-TRU waste. The frequency of this accident was estimated to be in the range of 10^{-4} to 10^{-6} per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 0.13 rem. This accident could result in a radiation dose of 0.044 rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 140 person-rem; this is equivalent to a probability of a latent cancer fatality of 0.084. Using 95-percent atmospheric conditions, this accident could result in about 1 latent cancer fatality for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

Although an accident involving dropping a HLW canister while loading a shipping cask could occur, the canisters are designed to resist breaching and tested to withstand a 7-meter (23-foot) drop onto an unyielding surface and it is unlikely that a canister would rupture if it were dropped during loading. Therefore, Tables 4-9 and 4-10 do not include analysis of this type of accident.

As in the No Action Alternative, DOE also analyzed accidents involving the ongoing management of Tanks 8D-1 and 8D-2, and determined that the consequences would be the same under both alternatives. These accidents assumed that a severe earthquake occurred at the WVDP site, causing the roof of the vault and Tank 8D-2 to collapse into the tank. Two accidents were analyzed, one where the contents of the tank were kept wet, and another were the contents of the tank were allowed to dry. The frequencies of the accidents were estimated to be in the range of 10^{-4} to 10^{-6} per year.

The consequences of the accidents using 50-percent atmospheric conditions are presented in Table 4-9. If the contents of the tanks are kept wet, the accident could result in a radiation dose of 2.4×10^{-3} rem for the worker located at the site. This accident could result in a radiation dose of 8.1×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 2.5 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.5×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.023 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

If the contents of the tanks are kept dry, this accident could result in a radiation dose of 2.8×10^{-3} rem for the worker located at the site (Table 4-9). This accident could result in a radiation dose of 9.5×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 3.0 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.8×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.028 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

The highest consequence accident in Table 4-9 was the fire at the RHWF. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of the fractions of the biota concentration guides for this accident was less than 1. Therefore, the radioactive releases for this accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.4.3 Transportation (Alternative A)

Under Alternative A, about 21,000 cubic meters (742,000 cubic feet) of radioactive waste would be shipped for disposal. These shipments would take place over 10 years. Although HLW would not be shipped to a geologic repository until sometime after 2025, HLW transportation impacts were included in Alternative A. Class A LLW would be shipped either to NTS, Hanford, or a commercial disposal site such as Envirocare. Class B and Class C LLW would be shipped either to the NTS or the Hanford Site. Mixed LLW, meeting disposal site waste acceptance criteria, would be shipped to Hanford, NTS, or a commercial disposal site such as Envirocare. TRU waste would be shipped to the WIPP site for disposal. HLW would be shipped to a geologic repository (assumed to be the proposed Yucca Mountain Repository for the purposes of evaluation in this EIS). The waste transportation destinations proposed under Alternative A are shown in Figure 4-2.

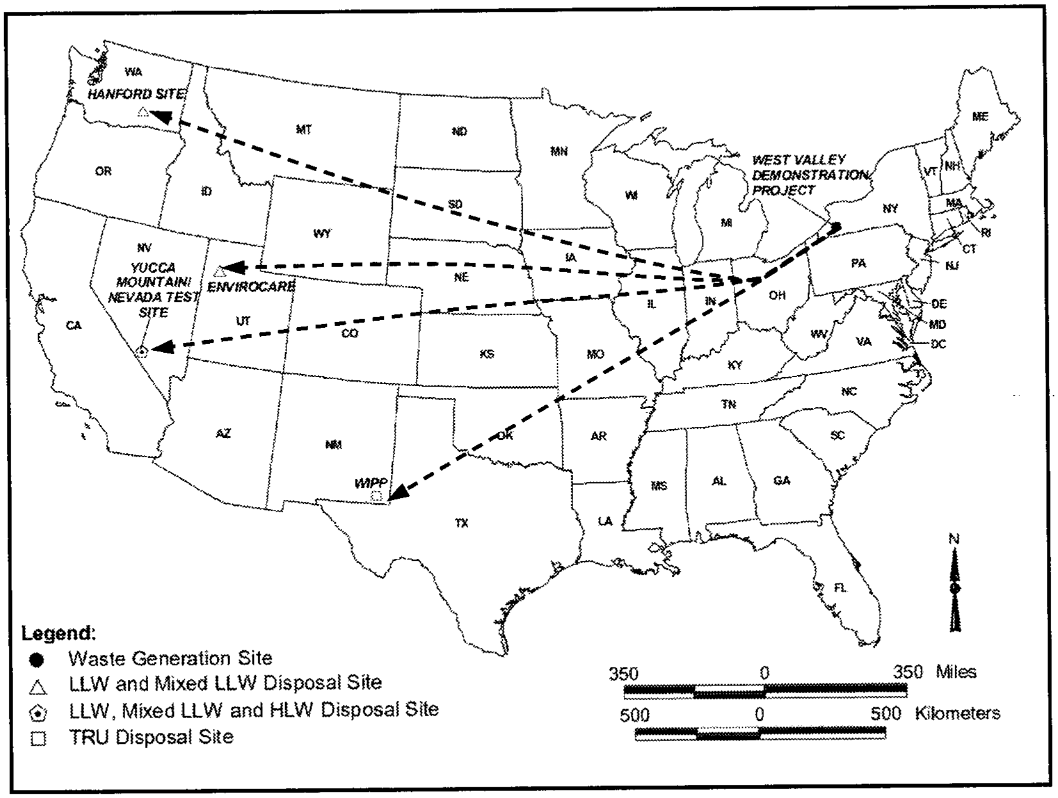

Figure 4-2. Waste Destinations Under Alternative A

Transportation impacts were estimated assuming 100 percent of the waste would be shipped by truck and 100 percent of the waste would be shipped by rail. Table 4-11 lists the waste shipments associated with Alternative A. These shipments would take place over 10 years.

4.4.3.1 Total Impacts from Transportation Activities

The transportation impacts of shipping radioactive waste would be from two sources: incident-free transportation and transportation accidents. Both radiological impacts and nonradiological impacts are included in the analysis. The total impacts from transportation would be the sum of the impacts from incident-free transportation and transportation accidents. Additional details on these analyses are provided in Appendix D.

Table 4-11. Waste Shipped Under Alternative A or B

Waste Type	Container Type	Waste Shipped (cubic feet)[a]	Number of Containers	Alternative A Shipments	Alternative B Shipments
Class A LLW	Boxes[b]	351,586	4,341	311 (truck) 156 (rail)	311 (truck) 156 (rail)
	Drums[b]	83,014	12,058	144 (truck) 72 (rail)	144 (truck) 72 (rail)
Class B LLW	HIC[c]	38,500	428	428 (truck) 107 (rail)	428 (truck) 107 (rail)
	Drums[b]	194	29	1 (truck) 1 (rail)	1 (truck) 1 (rail)
Class C LLW	HIC[c]	12,618	141	141 (truck) 36 (rail)	141 (truck) 36 (rail)
	55-gallon drums[c]	6,198	901	91 (truck) 23 (rail)	91 (truck) 23 (rail)
	71-gallon drums[b]	193,405	20,377	850 (truck) 213 (rail)	850 (truck) 213 (rail)
CH-TRU	Drums[c]	40,000	5,810	139 (truck) 139 (rail)	278 (truck)[d] 278 (rail)[d]
RH-TRU	Drums[c]	9,000	1,308	131 (truck) 33 (rail)	262 (truck)[e] 66 (rail)[f]
MLLW	Drums[b]	7,889	1,146	14 (truck) 7 (rail)	14 (truck) 7 (rail)
HLW	Canisters[c]		300[g]	300 (truck) 60 (rail)	600 (truck)[h] 120 (rail)[i]
Total		742,404	46,839	2,550 (truck) 847 (rail)	3,120 (truck)[j] 1,079 (rail)[k]

Acronyms: LLW = low-level radioactive waste; HIC = high-integrity container; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste

a. To convert cubic feet to cubic meters, multiply by 0.028.
b. Shipped in Type A shipping container.
c. Shipped in Type B shipping container.
d. 139 CH-TRU shipments from WVDP to interim storage, 139 CH-TRU shipments from interim storage to disposal.
e. 131 RH-TRU shipments from WVDP to interim storage, 131 RH-TRU shipments from interim storage to disposal.
f. 33 RH-TRU shipments from WVDP to interim storage, 33 RH-TRU shipments from interim storage to disposal.
g. Assumed to be 300 for purposes of analysis; actual number of canisters is 275.
h. 300 HLW shipments from WVDP to interim storage, 300 HLW shipments from interim storage to disposal.
i. 60 HLW shipments from WVDP to interim storage, 60 HLW shipments from interim storage to disposal.
j. Includes 270 TRU waste, and 300 HLW, truck shipments from interim storage to disposal. Alternative B would load the same number of truck shipments (2,550) at WVDP for shipment offsite as Alternative A.
k. Includes 172 TRU waste, and 60 HLW, rail shipments from interim storage to disposal. Alternative B would load the same number of rail shipments (847) at WVDP for shipment offsite as Alternative A.

Table 4-12 lists the total transportation impacts by waste type and destination expected under Alternative A. If either trucks or trains were used to ship the radioactive waste, less than 1 fatality would occur. For perspective, there would be about 400,000 traffic fatalities in the United States over the 10-year time period under Alternative A (U.S. Bureau of the Census 1997).

4.4.3.2 Incident-Free Impacts for the Maximally Exposed Individual from Transportation Activities

Worker Impacts. If trucks were used to ship the waste, the maximally exposed worker would be the truck driver. This worker would receive a radiation dose of about 2,000 mrem per year based on driving

Table 4-12. Transportation Impacts Under Alternative A

Waste Type	Destination	Incident-Free Public (LCFs)	Incident-Free Worker (LCFs)	Radiological Accident Risk (LCFs)	Pollution Health Effects (Fatalities)	Traffic Fatalities	Total Fatalities
Truck							
Class A LLW	Envirocare	0.025	0.031	1.4×10^{-4}	5.7×10^{-3}	0.030	0.092
	Hanford Site	0.030	0.037	1.5×10^{-4}	6.3×10^{-3}	0.038	0.11
	NTS	0.031	0.036	1.7×10^{-4}	7.6×10^{-3}	0.036	0.11
Class B LLW	Hanford Site	1.4×10^{-3}	0.028	0.065	5.9×10^{-3}	0.035	0.13
	NTS	1.6×10^{-3}	0.029	0.062	7.1×10^{-3}	0.034	0.13
Class C LLW	Hanford Site	0.087	0.20	5.5×10^{-7}	0.018	0.11	0.41
	NTS	0.089	0.19	6.5×10^{-7}	0.022	0.10	0.41
CH-TRU	WIPP	8.3×10^{-3}	0.010	7.5×10^{-4}	2.3×10^{-3}	0.012	0.033
RH-TRU	WIPP	6.5×10^{-3}	0.013	7.5×10^{-9}	2.2×10^{-3}	0.011	0.033
MLLW	Envirocare	7.7×10^{-4}	9.5×10^{-4}	1.0×10^{-5}	1.8×10^{-4}	9.2×10^{-4}	2.8×10^{-3}
	Hanford Site	9.2×10^{-4}	1.1×10^{-3}	1.1×10^{-5}	1.9×10^{-4}	1.2×10^{-3}	3.4×10^{-3}
	NTS	9.5×10^{-4}	1.1×10^{-3}	1.3×10^{-5}	2.3×10^{-4}	1.1×10^{-3}	3.4×10^{-3}
HLW	Repository	0.020	0.044	9.8×10^{-7}	5.8×10^{-3}	0.024	0.094
							Total Truck Fatalities: 0.79 – 0.82
Rail							
Class A LLW	Envirocare	0.044	0.033	5.3×10^{-4}	8.0×10^{-3}	0.026	0.11
	Hanford Site	0.045	0.035	5.8×10^{-4}	8.2×10^{-3}	0.034	0.12
	NTS	0.046	0.044	5.3×10^{-4}	8.1×10^{-3}	0.033	0.13
Class B LLW	Hanford Site	0.042	0.033	3.4×10^{-6}	3.9×10^{-3}	0.016	0.095
	NTS	0.043	0.045	3.1×10^{-6}	3.8×10^{-3}	0.017	0.11
Class C LLW	Hanford Site	0.13	0.10	1.2×10^{-6}	0.012	0.049	0.29
	NTS	0.13	0.14	1.1×10^{-6}	0.012	0.053	0.34
CH-TRU	WIPP	8.3×10^{-3}	8.1×10^{-3}	2.0×10^{-4}	3.4×10^{-3}	0.018	0.038
RH-TRU	WIPP	6.6×10^{-3}	6.4×10^{-3}	2.4×10^{-8}	8.0×10^{-4}	4.2×10^{-3}	0.018
MLLW	Envirocare	1.3×10^{-3}	1.0×10^{-3}	4.1×10^{-5}	2.4×10^{-4}	8.1×10^{-4}	3.4×10^{-3}
	Hanford Site	1.4×10^{-3}	1.1×10^{-3}	4.5×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	3.8×10^{-3}
	NTS	1.4×10^{-3}	1.3×10^{-3}	4.1×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	4.0×10^{-3}
HLW	Repository	7.6×10^{-3}	0.014	3.0×10^{-7}	4.2×10^{-3}	0.019	0.045
							Total Rail Fatalities: 0.60 – 0.68

Acronyms: LCFs = latent cancer fatalities; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste; NTS = Nevada Test Site; WIPP = Waste Isolation Pilot Plant. The range of total fatalities is based on the minimum and maximum total fatalities for each waste type.

the truck containing radioactive waste for 1,000 hours per year. This is equivalent to a probability of a latent cancer fatality of about 1.0×10^{-3}.

If trains were used to ship the waste, the maximally exposed worker would be an inspector. This worker would receive a radiation dose of about 190 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 9.5×10^{-5}.

Public Impacts. If trucks were used to ship the waste, the maximally exposed member of the public would be a person working at a service station who would receive a radiation dose of about 19 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-5}.

If trains were used to ship the waste, the maximally exposed member of the public would be a railyard worker who was not directly involved with handling the railcars. This person would receive a radiation dose of about 35 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 2.1×10^{-5}.

4.4.3.3 Impacts from the Maximum Reasonably Foreseeable Transportation Accidents

For waste shipped under Alternative A, the maximum reasonably foreseeable truck or rail transportation accident with the highest consequences would involve CH-TRU waste. Since one TRUPACT-II shipping container was assumed to be involved in either the truck or rail accident, the consequences for the truck or rail accident are the same. The probabilities of the truck and rail accidents are slightly different. The probability of the truck accident was 6×10^{-7} per year. For rail, the probability of the accident was 1×10^{-7} per year. The maximally exposed individual would receive a radiation dose of about 25 rem from this accident, which is equivalent to a latent cancer fatality risk of 0.015. The population would receive a collective radiation dose of approximately 6,600 person-rem from this accident. This could result in about 4 latent cancer fatalities. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of fractions of the biota concentration guides for the CH-TRU accident was less than 1. Therefore, the radioactive releases from the CH-TRU accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.4.4 Offsite Impacts (Alternative A)

Under Alternative A, 19,200 cubic meters (685,515 cubic feet) of LLW and 221 cubic meters (7,889 cubic feet) of mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP LLW and mixed LLW inventory were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 3.2×10^{-2} to 3.6×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 5.1×10^{-5} and 2.1×10^{-15}.

In addition, approximately 1,372 cubic meters (49,000 cubic feet) of TRU waste would be disposed of at WIPP. Disposal of this waste volume at WIPP would result in a probability that a worker would incur a latent cancer fatality of 1.0×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of 3.0×10^{-9}. The population within 80 kilometers (50 miles) of the site would have a probability of incurring a latent cancer fatality of 3.0×10^{-6}.

Disposal of 300 canisters of WVDP HLW[2] at a geologic repository at Yucca Mountain would result in a probability that a worker would incur a latent cancer fatality of 6.8×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of 3.1×10^{-7}. The population within 80 kilometers (50 miles) of the site would have a probability of incurring a latent cancer fatality of 2.0×10^{-2}.

Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

[2] For purposes of analysis, DOE assumed that vitrification of HLW at WVDP would result in the production of 300 canisters. Vitrification is now complete and has resulted in the production of 275 canisters. Therefore, the impacts associated with the 275 canisters actually produced would be lower than the impacts analyzed.

4.5 IMPACTS OF ALTERNATIVE B – OFFSITE SHIPMENT OF LLW AND MIXED LLW TO DISPOSAL AND SHIPMENT OF HLW AND TRU WASTE TO INTERIM STORAGE

Under **Alternative B**, LLW and mixed LLW would be shipped offsite for disposal at the same locations as Alternative A. TRU wastes would be shipped for interim storage at one of five DOE sites: Hanford Site; INEEL; ORNL; SRS; or WIPP. TRU wastes would subsequently be shipped to WIPP (or would remain at WIPP) for disposal. HLW would be shipped to SRS or Hanford for interim storage, with subsequent shipment to Yucca Mountain for disposal.

It is assumed that the shipment of LLW and mixed LLW to disposal would occur within the next 10 years, and that TRU waste and HLW would be shipped to interim storage during that same 10 years. Ultimate disposal of TRU wastes and HLW wastes would be subject to the same constraints described under Alternative A; however, the impacts of transporting these wastes to their ultimate disposal sites have been included in the impact analyses for this alternative. The waste storage tanks and their surrounding vaults would be managed as under the No Action Alternative.

4.5.1 Human Health Impacts (Alternative B)

This section characterizes the radiological impacts from Alternative B activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material from controlled releases to the environment. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services.

Worker Impacts. Under Alternative B, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, and offsite interim storage of RH-TRU, CH-TRU, and HLW prior to disposal. Management of the waste storage tanks would continue as under current operations. Table 4-13 presents the radiological impacts to involved and noninvolved workers for Alternative B. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 61 person-rem or about 6.1 person-rem per year from activities under Alternative B. Over this same time period, the individual radiation dose to the average involved worker would be about 260 mrem per year. This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (1.3×10^{-4}) latent cancer fatality or a chance of about 1 in 7,700 per year.

In addition to radiation doses from Alternative B activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both Alternative B activities and ongoing operations, the total collective radiation dose to the workers was estimated to be about 210 person-rem over the duration of Alternative B or about 21 person-rem per year (Table 4-13). This dose is equivalent to less than 1 (0.11) latent cancer fatality within the worker population.

Nonradiological impacts to workers, based on Bureau of Labor Statistics and the required work effort estimated to complete the actions proposed under Alternative B, are not expected to result in any non-lost workday injuries, lost workday injuries, or fatalities.

Public Impacts. Under Alternative B, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would continue as under current operations. Radiation doses to the public would be similar

Table 4-13. Radiation Doses for Involved and Noninvolved Workers Under Alternative B

Worker Population	Activity	Time Period (years)	Collective Dose: Annual (person-rem/yr)	Collective Dose: Total (person-rem)	Latent Cancer Fatalities: Annual	Latent Cancer Fatalities: Total
Involved workers[a]	Alternative B activities	10	6.1	61	3.1×10^{-3}	0.031
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	15	150	7.5×10^{-3}	0.075
All workers	Total	10	21	210	0.011	0.11

Worker Population	Activity	Time Period (years)	Individual Dose: Annual (mrem/yr)	Individual Dose: Total (mrem)	Latent Cancer Fatalities: Annual	Latent Cancer Fatalities: Total
Involved workers[a]	Alternative B activities	10	260	2,600	1.3×10^{-4}	1.3×10^{-3}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	59	590	3.0×10^{-5}	3.0×10^{-4}

a. Involved workers would be those individuals that actively participate in Alternative B.

b. Noninvolved workers would be those individuals that would be onsite but would not actively participate in Alternative B.

to the radiation doses for ongoing operations at the WVDP and thus would be the same as under the No Action Alternative and Alternative A. Annual and total radiation doses to the public (maximally exposed individual and collective population) are listed in Table 4-14.

Annual Dose. The collective radiation dose through all exposure pathways (air and water) to people living within 80 kilometers (50 miles) of the site would be about 0.25 person-rem per year. This is equivalent to less than 1 (1.5×10^{-4}) latent cancer fatality in the exposed population each year. The radiation dose through all exposure pathways to the maximally exposed individual living around the WVDP site would be about 0.062 mrem per year. This radiation dose is 0.062 percent of the DOE standard of 100 mrem per year (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and would result in less than 1 (3.7×10^{-8}) latent cancer fatality per year or a chance of about 1 in 27 million for the maximally exposed individual.

Total Dose. For the duration of the No Action Alternative (10 years), the total collective radiation dose through all exposure pathways to the population around the WVDP site would be about 2.5 person-rem. This is equivalent to less than 1 (1.5×10^{-3}) latent cancer fatality over the duration of Alternative B.

4.5.2 Impacts from Facility Accidents (Alternative B)

The onsite activities proposed under Alternative B would be the same as those proposed under Alternative A. The facility accidents characterized previously in Section 4.4.2 would be representative of Alternative B and would have the same consequences. Therefore, the potential facility accidents characterized in Section 4.4.2 and their consequences will not be repeated here. As with the No Action Alternative and Alternative A, accidents involving ongoing or continuing activities at the WVDP site that were not part of this EIS have been addressed in other documents such as the *Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West*

Table 4-14. Radiation Doses to the Public Under Alternative B[a]

Activity	Maximally Exposed Individual				Population Around WVDP Site			
	Individual Radiation Dose[b]		Probability of Latent Cancer Fatality		Collective Radiation Dose[c]		Probability of Latent Cancer Fatality	
	Annual (mrem/yr)	Total (mrem)	Annual	Total	Annual (person-rem/yr)	Total (person-rem)	Annual	Total
Ongoing operations at WVDP								
Airborne releases	0.021	0.21	1.3×10^{-8}	1.3×10^{-7}	0.17	1.7	1.0×10^{-4}	1.0×10^{-3}
Percent of EPA standard (10 mrem per year)	<1	NA[d]	NA	NA	NA	NA	NA	NA
Waterborne releases	0.041	0.41	2.5×10^{-8}	2.5×10^{-7}	0.083	0.83	5.0×10^{-5}	5.0×10^{-4}
All pathways	0.062	0.62	3.7×10^{-8}	3.7×10^{-7}	0.25	2.5	1.5×10^{-4}	1.5×10^{-3}
Percent of DOE standard (100 mrem per year)	<1	NA	NA	NA	NA	NA	NA	NA
Percent of natural background	<1	NA	NA	NA	<1	NA	NA	NA

a. The time period for Alternative B is 10 years.
b. Individual background radiation doses are about 300 mrem per year.
c. The collective radiation dose to the 1.5-million-person population that surrounds the WVDP site from natural background is about 380,000 person-rem per year.
d. NA = not applicable.

Valley Final Environmental Impact Statement (DOE 1982) and several facility safety analysis reports and environmental assessments. For example, accidents involving the High-Level Waste Vitrification Facility are characterized in the *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS 2000b).

4.5.3 Transportation (Alternative B)

Under Alternative B, about 21,000 cubic meters (742,000 cubic feet) of radioactive waste would be shipped for disposal. These are the same volumes that would be shipped under Alternative A. These shipments would take place over 10 years. Although HLW would not be shipped to a geologic repository until sometime after 2025, HLW transportation impacts were included in Alternative B. As was the case for Alternative A, under Alternative B Class A LLW would be shipped either to NTS, Hanford, or a commercial disposal site such as Envirocare; Class B and Class C LLW would be shipped either to the NTS or the Hanford Site; and mixed LLW would be shipped to Hanford, NTS, or a commercial disposal site such as Envirocare. In contrast to Alternative A, TRU waste would be shipped first to Hanford, INEEL, ORNL, or SRS for storage, then to WIPP for disposal. TRU waste could also be shipped to WIPP for interim storage prior to disposal there. HLW would be shipped first to the SRS or Hanford for storage, then to a geologic repository for disposal (again, assumed to be the proposed Yucca Mountain Repository for the purposes of evaluation in this EIS). The waste transportation destinations proposed under Alternative B are shown in Figure 4-3.

Transportation impacts were estimated assuming that 100 percent of the waste would be shipped by truck and that 100 percent of the waste would be shipped by rail. Table 4-11 lists the waste shipments

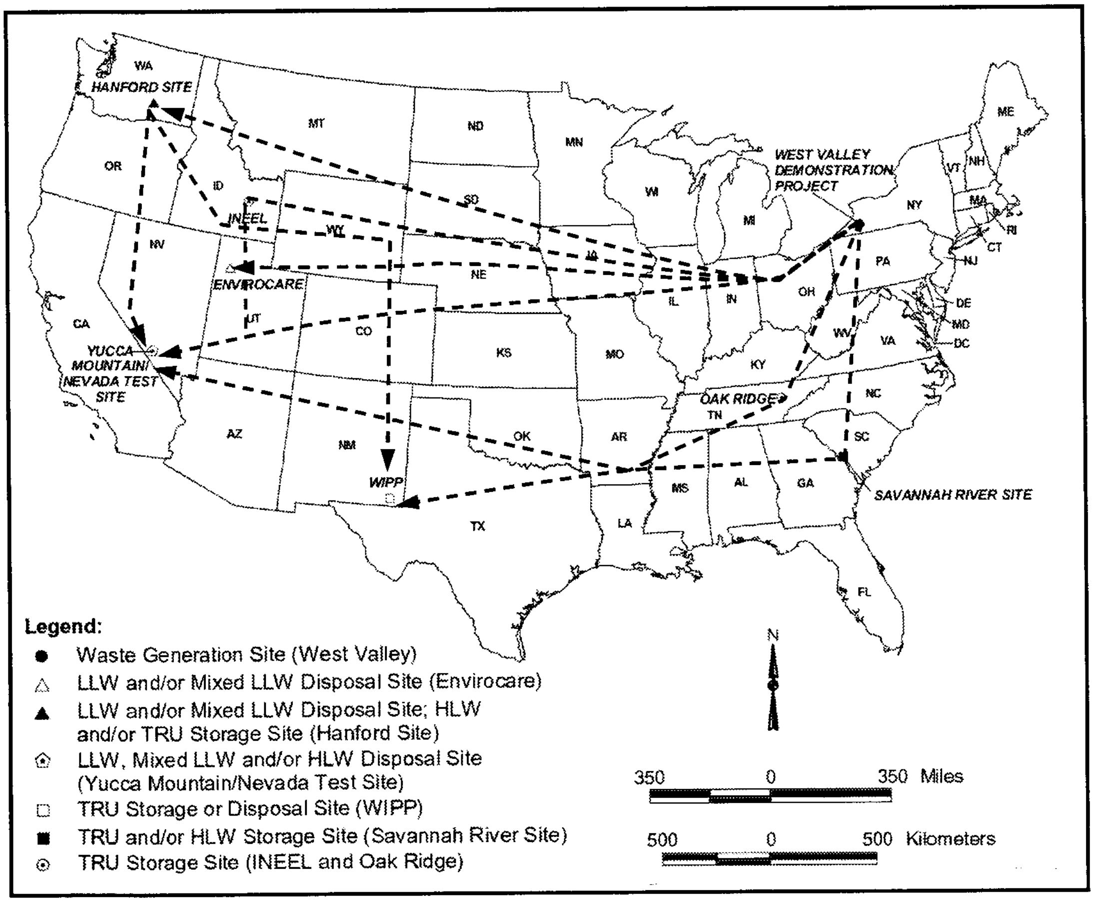

Figure 4-3. Waste Destinations Under Alternative B

associated with Alternative B. Because only the destinations for TRU waste and HLW vary between Alternatives A and B, the reader will see very little difference among the impacts to workers or the public for these alternatives.

4.5.3.1 Total Impacts from Transportation Activities

Table 4-15 lists the total transportation impacts by waste type and destination expected under Alternative B. If either trucks or trains were used to ship the radioactive waste, less than one fatality would occur. For perspective, there would be about 400,000 traffic fatalities in the United States during the 10-year time period under Alternative B (U.S. Bureau of the Census 1997).

4.5.3.2 Incident-Free Impacts for the Maximally Exposed Individual from Transportation Activities

Worker Impacts. If trucks were used to ship the waste, the maximally exposed worker would be the truck driver. This worker would receive a radiation dose of about 2,000 mrem per year based on driving the truck containing radioactive waste for 1,000 hours per year. This is equivalent to a probability of a latent cancer fatality of about 1.0×10^{-3}.

If trains were used to ship the waste, the maximally exposed worker would be an inspector. This worker would receive a radiation dose of about 190 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 9.5×10^{-5}.

Table 4-15. Transportation Impacts Under Alternative B

Waste Type	Destination	Incident-Free (LCFs)		Radiological Accident Risk (LCFs)	Pollution Health Effects	Traffic Fatalities	Total Fatalities
		Public	Worker				
Truck							
Class A LLW	Envirocare	0.025	0.031	1.4×10^{-4}	5.7×10^{-3}	0.030	0.092
	Hanford Site	0.030	0.037	1.5×10^{-4}	6.3×10^{-3}	0.038	0.11
	NTS	0.031	0.036	1.7×10^{-4}	7.6×10^{-3}	0.036	0.11
Class B LLW	Hanford Site	0.028	0.065	8.2×10^{-7}	5.9×10^{-3}	0.035	0.13
	NTS	0.029	0.062	9.4×10^{-7}	7.1×10^{-3}	0.034	0.13
Class C LLW	Hanford Site	0.087	0.20	5.5×10^{-7}	0.018	0.11	0.41
	NTS	0.089	0.19	6.5×10^{-7}	0.022	0.10	0.41
CH-TRU	SRS → WIPP	8.8×10^{-3}	0.012	1.0×10^{-3}	2.7×10^{-3}	0.015	0.040
	INEEL → WIPP	0.011	0.016	6.7×10^{-4}	2.5×10^{-3}	0.016	0.046
	ORNL → WIPP	7.7×10^{-3}	0.012	6.4×10^{-4}	2.2×10^{-3}	0.012	0.034
	Hanford → WIPP	0.013	0.019	7.8×10^{-4}	3.0×10^{-3}	0.020	0.056
RH-TRU	SRS → WIPP	6.9×10^{-3}	0.015	1.0×10^{-8}	2.5×10^{-3}	0.014	0.039
	INEEL → WIPP	8.4×10^{-3}	0.021	7.3×10^{-9}	2.4×10^{-3}	0.015	0.046
	ORNL → WIPP	6.1×10^{-3}	0.014	6.4×10^{-9}	2.0×10^{-3}	0.011	0.034
	Hanford → WIPP	0.010	0.025	8.4×10^{-9}	2.8×10^{-3}	0.019	0.057
MLLW	Envirocare	7.7×10^{-4}	9.5×10^{-4}	1.0×10^{-5}	1.8×10^{-4}	9.2×10^{-4}	2.8×10^{-3}
	Hanford Site	9.2×10^{-4}	1.1×10^{-3}	1.1×10^{-5}	1.9×10^{-4}	1.2×10^{-3}	3.4×10^{-3}
	NTS	9.5×10^{-4}	1.1×10^{-3}	1.3×10^{-5}	2.3×10^{-4}	1.1×10^{-3}	3.4×10^{-3}
HLW	SRS → Repository	0.032	0.067	2.6×10^{-6}	9.6×10^{-3}	0.047	0.16
	Hanford Site → Repository	0.030	0.069	1.4×10^{-6}	8.0×10^{-3}	0.037	0.14
							Total Truck Fatalities: 0.84 – 0.93
Rail							
Class A LLW	Envirocare	0.044	0.033	5.3×10^{-4}	8.0×10^{-3}	0.026	0.11
	Hanford Site	0.045	0.035	5.8×10^{-4}	8.2×10^{-3}	0.034	0.12
	NTS	0.046	0.044	5.3×10^{-4}	8.1×10^{-3}	0.033	0.13
Class B LLW	Hanford Site	0.042	0.033	3.4×10^{-6}	3.9×10^{-3}	0.016	0.095
	NTS	0.043	0.045	3.1×10^{-6}	3.8×10^{-3}	0.017	0.11
Class C LLW	Hanford Site	0.13	0.10	1.2×10^{-6}	0.012	0.049	0.29
	NTS	0.13	0.14	1.1×10^{-6}	0.012	0.053	0.34
CH-TRU	SRS → WIPP	0.014	0.015	2.9×10^{-4}	5.8×10^{-3}	0.037	0.072
	INEEL → WIPP	0.014	0.016	3.4×10^{-4}	5.8×10^{-3}	0.023	0.059
	ORNL → WIPP	0.012	0.015	2.5×10^{-4}	5.1×10^{-3}	0.022	0.055
	Hanford → WIPP	0.016	0.017	4.3×10^{-4}	6.7×10^{-3}	0.032	0.073
RH-TRU	SRS → WIPP	0.011	0.012	3.1×10^{-8}	1.4×10^{-3}	8.8×10^{-3}	0.033
	INEEL → WIPP	0.011	0.013	4.0×10^{-8}	5.4×10^{-3}	0.021	0.050
	ORNL → WIPP	9.8×10^{-3}	0.011	2.9×10^{-8}	4.8×10^{-3}	0.021	0.047
	Hanford → WIPP	0.013	0.014	5.0×10^{-8}	6.3×10^{-3}	0.030	0.063
MLLW	Envirocare	1.3×10^{-3}	1.0×10^{-3}	4.1×10^{-5}	2.4×10^{-4}	8.1×10^{-4}	3.4×10^{-3}
	Hanford Site	1.4×10^{-3}	1.1×10^{-3}	4.5×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	3.8×10^{-3}
	NTS	1.4×10^{-3}	1.3×10^{-3}	4.1×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	4.0×10^{-3}
HLW	SRS → Repository	0.010	0.021	3.0×10^{-7}	6.1×10^{-3}	0.035	0.072
	Hanford Site → Repository	9.4×10^{-3}	0.021	3.9×10^{-7}	5.3×10^{-3}	0.030	0.066
							Total Rail Fatalities: 0.66 – 0.79

Acronyms: LCFs = latent cancer fatalities; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste; SRS = Savannah River Site; NTS = Nevada Test Site; WIPP = Waste Isolation Pilot Plant; INEEL = Idaho National Engineering and Environmental Laboratory; ORNL = Oak Ridge National Laboratory. The range of total fatalities is based on the minimum and maximum total fatalities for each waste type.

Public Impacts. If trucks were used to ship the waste, the maximally exposed member of the public would be a person working at a service station who would receive a radiation dose of about 19 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-5}.

If trains were used to ship the waste, the maximally exposed member of the public would be a rail yard worker who was not directly involved with handling the railcars. This person would receive a radiation dose of about 35 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 2.1×10^{-5}.

4.5.3.3 Impacts from the Maximum Reasonably Foreseeable Transportation Accidents

As is the case for Alternative A, for waste shipped under Alternative B, the maximum reasonably foreseeable truck or rail transportation accident with the highest consequences would involve CH-TRU waste. Because one TRUPACT-II shipping container was assumed to be involved in either the truck or rail accident, the consequences for the truck or rail accident are the same. However, the probability of the truck and rail accidents are slightly different. The probability of the truck accident was 8×10^{-7} per year. For rail, the probability of the accident was 3×10^{-7} per year. The maximally exposed individual would receive a radiation dose of about 25 rem from this accident, which is equivalent to a latent cancer fatality risk of 0.015. The population would receive a collective radiation dose of approximately 6,600 person-rem from this accident. This could result in about 4 latent cancer fatalities. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of fractions of the biota concentration guides for the CH-TRU accident was less than 1. Therefore, the radioactive releases from the CH-TRU accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.5.4 Offsite Impacts (Alternative B)

Under Alternative B, LLW and mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP LLW and mixed LLW inventory were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 3.2×10^{-2} to 3.6×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 5.1×10^{-5} and 2.1×10^{-15}.

In addition, approximately 1,372 cubic meters (49,000 cubic feet) of TRU waste would be stored at Hanford, INEEL, ORNL, SRS, or WIPP. Interim storage of this waste volume would result in a probability that a worker would incur a latent cancer fatality of between 2.5×10^{-3} and 1.6×10^{-4}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 6.9×10^{-7} and 2.1×10^{-10}. The populations within 80 kilometers (50 miles) of the sites would have a probability of incurring a latent cancer fatality of between 2.6×10^{-3} and 2.3×10^{-5}.

HLW currently stored at WVDP would be stored at Hanford or SRS. Interim storage of 300 canisters of WVDP HLW at these sites would result in a probability that a worker would incur a latent cancer fatality of between 2.0×10^{-2} and 3.6×10^{-2}.

Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

4.6 ENVIRONMENTAL JUSTICE IMPACTS

In February 1994, the President issued Executive Order 12898, titled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* [59 Fed. Reg. 7629-7633 (1994)]. This Order directs federal agencies to incorporate environmental justice as part of their missions. As such, federal agencies are specifically directed to identify and address as appropriate disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

The Council on Environmental Quality has issued guidance (CEQ 1997) to federal agencies to assist them with their NEPA procedures so that environmental justice concerns are effectively identified and addressed. In this guidance, the Council encouraged federal agencies to supplement the guidance with their own specific procedures tailored to particular programs or activities of an agency. DOE has prepared the *Draft Guidance on Incorporating Environmental Justice Considerations into the Department of Energy's National Environmental Policy Act Process* (DOE 2000) based on Executive Order 12898 and the Council on Environmental Quality environmental justice guidance.

Among other things, the DOE draft guidance states that even for actions that are at the low end of the sliding scale with respect to the significance of environmental impacts, some consideration (which could be qualitative) is needed to show that DOE considered environmental justice concerns. DOE needs to demonstrate that it considered apparent pathways or uses of resources that are unique to a minority or low-income community before determining whether, even in light of these special pathways or practices, there are disproportionately high and adverse impacts on the minority or low-income population. The DOE draft guidance also defines "minority population" as a populace where either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population.

For this Waste Management EIS, DOE applied the environmental justice guidance to determine whether there could be any disproportionately high and adverse human health or environmental impacts on minority or low-income populations surrounding the WVDP site as a result of the implementation of any of the alternatives analyzed. Analysis of environmental justice concerns was based on an assessment of the impacts reported in Sections 4.3 through 4.5. Although no high and adverse impacts were identified to any receptor from either the proposed onsite waste management actions or the offsite shipments of wastes, DOE considered whether minority or low-income populations would be disproportionately affected by the ongoing management of the WVDP site, particularly taking into account subsistence fishing on the part of some residents of the Cattaraugus Reservation of the Seneca Nation of Indians.

Subsistence Consumption of Fish. Consumption of food and water is a major source of exposure to potentially hazardous substances for U.S. residents. These pathways are also expected to be the primary routes through which a resident of the Cattaraugus Reservation of the Seneca Nation could be exposed to releases from the WVDP site. Because a member of the Seneca Nation may consume more fish from local waters than other members of the population around the WVDP site, DOE performed an additional dose assessment for increased fish consumption.

Specifically, DOE evaluated the potential human health impacts that could occur from the consumption by one individual of up to 62 kilograms (137 pounds) of game fish per year, compared to 21 kilograms (46 pounds) of game fish assumed for the maximally exposed individual in the WVDP Annual Site Environmental Reports. The 62-kilogram consumption rate represents the 95th percentile fish consumption rate for Native Americans from the *Exposure Factors Handbook* (EPA 1997).

Over the period 1995 through 1999, the average radiation dose from fish consumption reported in the WVDP Annual Site Environmental Reports (WVNS 1996, 1997, 1998, 1999, 2000c) was 0.016 mrem per year, based on eating 21 kilograms (46 pounds) of fish per year. The radiation dose from eating 62 kilograms (137 pounds) of fish per year was 0.05 mrem per year. These radiation doses are less than 0.1 percent of the DOE standard of 100 mrem per year from DOE Order 5400.5 and would result in less than 1 (3.0×10^{-8}) latent cancer fatality. Based on this analysis, DOE concludes that implementation of any of the alternatives would not result in disproportionately high and adverse impacts on the minority or low-income population in the region, even in light of possible increased exposure through subsistence fishing. Additional information concerning the assessment of human health impacts is provided in Appendix C.

Transportation. The transportation of radioactive waste would use the nation's existing highways and railroads. As described in previous sections, the total impacts from transportation would be very low (less than 1 fatality over 10 years) and therefore would not present a large health or safety risk to the population as a whole, or to workers or individuals along transportation routes. Based on this analysis, DOE concludes that implementation of any of the alternatives would not result in disproportionately high and adverse impacts on the minority or low-income populations along transportation routes.

Only a severe accident that resulted in a considerable release of radioactive material could cause high and adverse impacts in the affected populations. Because the risk of these accidents applies to the entire population along transportation routes, it would not apply disproportionately to any minority or low-income populations along the routes.

Additional information concerning the assessment of transportation impacts is provided in Appendix D.

Offsite Activities. The potential that low-income or minority populations could experience disproportionately high and adverse environmental consequences at sites where waste management activities would occur was addressed in earlier NEPA documents (see Section 1.7.1). No such potential impacts were identified for any site. For LLW, mixed LLW, and HLW, the potential for adverse human health impacts as a result of waste management activities is low, and no disproportionately high and adverse health effects would be expected for any particular segment of the population, including low-income or minority populations.

With respect to TRU waste, the WM PEIS concluded that the potential for disproportionately high and adverse human health effects as a result of TRU waste treatment operations was low for all sites except INEEL and WIPP (WM PEIS, Section 8.10.1). At those sites, the maximally exposed individual member of the public would be located in a census tract that contained a low-income or minority population. WVDP TRU waste, however, would be stored on these sites on an interim basis and would not be treated. Therefore, DOE does not anticipate that the interim storage of WVDP TRU waste at either of these sites would pose disproportionately high and adverse impacts on low-income or minority populations.

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