
3.3 Waste Management and Chemical Inventories

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Waste Management

Waste produced from Hanford cleanup operations is classified as either radioactive, nonradioactive, dangerous, nondangerous, toxic, or mixed waste. Radioactive waste is categorized as transuranic, high-level, and low-level. Mixed waste has both radioactive and hazardous nonradioactive substances. Hazardous waste contains either dangerous waste or extremely hazardous waste or both, as defined in the Washington State Department of Ecology's Dangerous Waste Regulations. Hanford's hazardous wastes are managed in accordance with Washington Administrative Code (WAC) 173-303. Toxic wastes are managed in accordance with Toxic Substance Control Act regulations.

Radioactive and mixed waste are currently handled in several ways. High-level waste is stored in single- and double-shell tanks. Low-level waste is stored in double-shell tanks, on storage pads, or is buried. The method used to manage low-level waste depends on the source, composition, and concentration of the waste. Transuranic waste is stored in vaults or on underground and aboveground storage pads from which it can be retrieved.

Approximately 200 Hanford Site facilities have the capacity to generate dangerous waste. An annual report lists the dangerous wastes and extremely hazardous wastes generated, treated, stored, and disposed of onsite and offsite (DOE 1996b). Dangerous wastes are treated, stored, and prepared for disposal at several Hanford Site facilities. Dangerous wastes generated at the Site are also shipped offsite for disposal, destruction, or recycling.

Nondangerous, nonradioactive wastes generated at the Hanford Site historically have been buried near the 200 Areas in Hanford's Solid Waste Landfill. In March 1996, this landfill was closed. Since December 1995, nondangerous, nonradioactive wastes have been disposed of at the Richland Landfill, which is located at the southern edge of the Hanford Site boundary. Since February

1996, medical wastes have been shipped to Waste Management of Kennewick and asbestos has been shipped to Basin Disposal, Inc. in Pasco. Since March 1996, nonradioactive drummed waste has been shipped to Waste Management of Kennewick.

These nondangerous, nonradioactive wastes originate at a number of areas across the Site. Examples of these wastes are construction debris, office trash, cafeteria waste, and packaging materials. Other materials and items classified as waste are solidified filter backwash and sludge from the treatment of river water, failed and broken equipment and tools, air filters, uncontaminated used gloves and other clothing, and certain chemical precipitates such as oxalates. Nonradioactive friable asbestos is buried in designated areas at the Solid Waste Landfill. Ash generated at powerhouses in the 200-East and 200-West Areas is buried in designated sites near those powerhouses. Demolition wastes from 100 Areas decommissioning projects are buried in situ or in designated sites in the 100 Areas.

Annual reports document the quantities and types of solid wastes generated or received onsite, shipped offsite, and disposed of at the Hanford Site (WHC 1996a). Solid waste program activities are regulated by the Resource Conservation and Recovery Act and Toxic Substances Control Act, discussed in Section 2.0, "Environmental Compliance Summary." Solid waste quantities generated onsite, received from offsite, shipped offsite, and disposed of at the Hanford Site from 1990 through 1995 are shown in Tables 3.3.1 through 3.3.3. Table 3.3.4 provides a detailed summary of the radioactive solid wastes disposed of in 1995.

The quantities of liquid wastes generated in 1995 and stored in underground storage tanks are included in the annual dangerous waste report (DOE 1996b). Table 3.3.5 is a summary of the liquid wastes generated from 1990 through 1995, which are stored in underground storage tanks.

Table 3.3.1. Quantities of Solid Wastes^(a) Generated on the Hanford Site, kg^(b)

Waste Category	1990	1991	1992	1993	1994	1995
Mixed	1,025,084	475,370	48,641	150,012	567,670	131,755
Radioactive	1,325,045	1,069,703	682,684	1,116,616	1,390,647	1,892,636

(a) Solid waste includes containerized liquid waste.

(b) Multiply kg by 2.205 to convert to lb.

Table 3.3.2. Quantities of Solid Wastes^(a) Received from Offsite, kg^(b)

Waste Category	1990	1991	1992	1993	1994	1995
Mixed	0	23,605	40,897	207,905	96,409	52,796
Radioactive	239,669	629,686	1,010,439	1,587,884	1,355,653	1,306,194

(a) Solid waste contains containerized liquid waste. Solid waste quantities do not include naval reactor submarine compartments.

(b) Multiply kg by 2.205 to convert to lb.

Table 3.3.3. Quantities of Hazardous Wastes^(a) Shipped Offsite, kg^(b)

Waste Category	1990	1991	1992	1993	1994	1995
Containerized	92,811	89,354	181,305	123,754	267,113	224,003
Bulk Solids		0	433,330	250,235	2,872,661	477,648
Bulk Liquid		331,905	11,089	94,065	248,917	130,156
Totals	92,811	421,259	625,724 ^(c)	468,054 ^(d)	3,388,691 ^(e)	831,807

(a) Does not include Toxic Substances Control Act wastes.

(b) Multiply kg by 2.205 to convert to lb.

(c) Includes 418,676 kg from demolition of 2727-S Building.

(d) Includes 250,235 kg from demolition of 190-B Building.

(e) Includes 2,658,788 kg from North Slope cleanup and 160,883 kg from carbon tetrachloride soil extraction.

Chemical Inventories

The types, quantities, and locations of hazardous chemicals are tracked through compliance activities associated with the Emergency Planning and Community Right-To-Know Act of 1986 (see Section 2.2, "Community

Right-To-Know Activities"). The *1995 Hanford Tier Two Emergency and Hazardous Chemical Inventory* (DOE 1996bc) was issued in March 1995, in compliance with Section 312 of the Act. Table 3.3.6 summarizes the information reported, listing the 10 chemicals stored in greatest quantity on the Hanford Site in 1995.

Table 3.3.4. Radioactive Solid Wastes Stored or Disposed of in 1995^(a)

Constituent	Quantity, Ci					
	Low-Level	Low-Level Mixed	Low-Level Plus ^(b)	Low-Level Mixed Plus ^(c)	Transuranic	Transuranic Mixed
³ H	2.71 x 10 ⁴	6.29 x 10 ⁻¹	0.00	0.00	0.00	0.00
⁵⁴ Mn	8.25 x 10 ³	2.30 x 10 ⁻²	0.00	0.00	7.70 x 10 ⁻³	0.00
⁵⁵ Fe	1.43 x 10 ³	7.32 x 10 ⁻⁴	0.00	7.48 x 10 ⁴	0.00	0.00
⁶⁰ Co	3.43 x 10 ⁴	6.93 x 10 ⁰	0.00	6.20 x 10 ⁴	1.48 x 10 ¹	2.24 x 10 ⁻²
⁶³ Ni	9.00 x 10 ¹	1.14 x 10 ⁰	0.00	1.16 x 10 ⁵	0.00	0.00
⁹⁰ Sr	1.10 x 10 ⁴	3.36 x 10 ¹	6.78 x 10 ⁻⁴	3.64 x 10 ⁰	3.40 x 10 ²	9.99 x 10 ⁰
⁹⁰ Y	1.10 x 10 ⁴	3.36 x 10 ¹	6.78 x 10 ⁻⁴	3.64 x 10 ⁰	3.40 x 10 ²	9.99 x 10 ⁰
⁹⁹ Tc	0.00	1.61 x 10 ⁻¹	0.00	0.00	3.14 x 10 ⁻³	0.00
¹³⁷ Cs	6.36 x 10 ³	1.38 x 10 ¹	5.20 x 10 ⁻⁴	1.14 x 10 ¹	1.01 x 10 ³	1.82 x 10 ⁰
^{137m} Ba	6.02 x 10 ³	1.31 x 10 ¹	4.92 x 10 ⁻⁴	1.08 x 10 ¹	9.59 x 10 ²	1.72 x 10 ⁰
²³² Th	4.03 x 10 ⁻²	9.59 x 10 ⁻³	0.00	0.00	0.00	0.00
²³³ U	4.65 x 10 ⁻²	7.53 x 10 ⁻⁴	0.00	0.00	6.49 x 10 ⁻¹	0.00
²³⁴ U	2.11 x 10 ⁻²	1.39 x 10 ⁻²	0.00	0.00	3.16 x 10 ⁻⁵	0.00
²³⁵ U	6.79 x 10 ⁻¹	1.68 x 10 ⁻³	0.00	0.00	5.55 x 10 ⁻³	0.00
²³⁶ U	1.56 x 10 ⁻⁴	2.37 x 10 ⁻⁵	0.00	0.00	3.24 x 10 ⁻⁷	0.00
²³⁸ U	5.04 x 10 ¹	1.45 x 10 ⁻²	0.00	0.00	2.15 x 10 ⁻³	0.00
²³⁸ Pu	(d)	(d)	(d)	(d)	9.70 x 10 ¹	3.00 x 10 ⁰
²³⁹ Pu	(d)	(d)	(d)	(d)	4.29 x 10 ²	5.22 x 10 ¹
²⁴⁰ Pu	(d)	(d)	(d)	(d)	1.60 x 10 ²	1.17 x 10 ¹
²⁴¹ Pu	(d)	(d)	(d)	(d)	7.59 x 10 ³	3.57 x 10 ²
²⁴² Pu	(d)	(d)	(d)	(d)	4.72 x 10 ⁻²	7.07 x 10 ⁻⁴
²⁴¹ Am	(d)	(d)	(d)	(d)	1.22 x 10 ²	2.33 x 10 ⁰
²⁴⁴ Cm	(d)	(d)	(d)	(d)	1.37 x 10 ²	0.00

- (a) Presently only low-level and low-level mixed plus wastes are permanently disposed of on the Hanford Site. Low-level mixed, transuranic, and mixed transuranic wastes are managed as stored wastes. This table does not include inventories of waste contained in temporary storage facilities. The “mixed” category identifies wastes that are regulated under the Resource Conservation and Recovery Act. The “plus” category identifies wastes that are regulated under the Toxic Substances Control Act (e.g., polychlorinated biphenyls).
- (b) Low-level with polychlorinated biphenyls.
- (c) Low-level mixed with polychlorinated biphenyls. All quantities in this category are from the naval reactor compartments disposed of at the Hanford Site.
- (d) Since 1970, wastes containing transuranic elements have been segregated and managed in separate waste categories known as transuranic and transuranic mixed waste.

Table 3.3.5. Quantities of Bulk Liquid Wastes^(a) Generated on the Hanford Site, L^(b)

1990	1991	1992	1993	1994	1995
41,592,687	15,498,826	12,604,981	22,176,538	10,726,296	18,217,841

- (a) Bulk liquid waste is defined as liquid waste sent to double-shell underground storage tanks. This does not include containerized waste (e.g., barreled), which are included in the solid waste category.
- (b) Multiply L by 0.2642 to convert to gal.

Table 3.3.6. Average Balance of Ten Chemicals Stored in Greatest Quantity, 1995

<u>Hazardous Material</u>	<u>Average Daily Balance, kg^(a)</u>
Coal	23,000,000
Mineral oil	1,900,000
Sodium	1,200,000
Diesel fuel	840,000
Bentonite	590,000
#6 Fuel oil	580,000
Nitric acid	340,000
Ethylene glycol	240,000
Unleaded gasoline	140,000
Aluminum sulfate dihydrate	94,000

(a) Multiply kg by 2.205 to convert to lb.