E.2 WASTE MANAGEMENT ACTIVITIES

E.2.1 HANFORD SITE

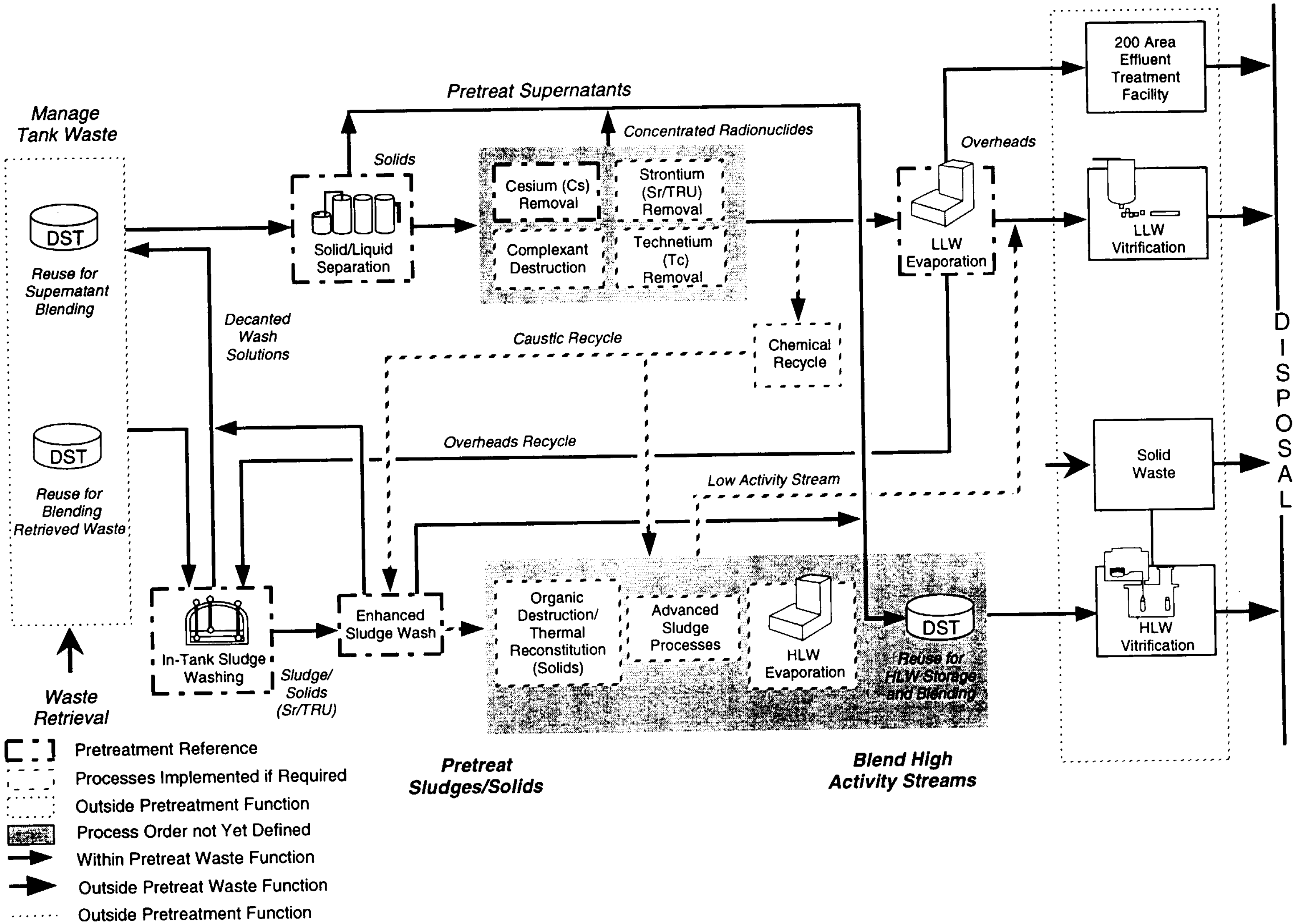
Established in 1943, Hanford facilities were primarily dedicated to the production of weapons-grade plutonium (Pu) and management of the wastes generated by defense activities. In later years, these missions were expanded to include increasingly diverse programs involving R&D for advanced reactors, renewable energy technologies, waste disposal technologies, and the cleanup of contamination from past activities.

Today, production of enriched fuel at Hanford reactors and recovery of Pu no longer occur. Hanford's primary mission is the cleanup of the site. On May 15, 1989, DOE, the Washington State Department of Ecology, and the EPA signed the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), an agreement to clean up radioactive and chemical waste at the site over the next 30 years. It contains a blueprint for the cleanup and uses enforceable milestones to keep the program on schedule. The Tri-Party Agreement negotiations—completed in 1993 and approved in January 1994—changed and added many new milestones. Most of the changes were related to the tank waste remediation system.

The waste management program accounts for the majority of lifecycle costs at Hanford. Much of the emphasis is placed on tank waste, which, when processed, will yield vitrified HLW and LLW fractions. Waste management programs at Hanford are divided into five key areas: (1) the tank waste remediation system program managing HLW, (2) spent nuclear fuel storage at the K-Basins and other locations, (3) cesium (Cs) and strontium capsule management at the waste encapsulation and storage facility at B-Plant, (4) liquid waste management, and (5) solid waste management. Each waste management program is described in the discussions that follow with regard to treatment, storage and handling, and disposal activities associated with spent nuclear fuel and the following waste categories: high-level, TRU, low-level, mixed, hazardous, and nonhazardous. Figure E.2.1–1 depicts tank waste management at Hanford.

Pollution Prevention. Radioactive, hazardous, and mixed wastes are treated, stored, or disposed of at Hanford. The total amount of waste generated and disposed of at Hanford has been, and is being, reduced through the efforts of the pollution prevention and waste minimization programs at the site. The Hanford Site Pollution Prevention Program is an ambitious program aimed at source reduction, product substitution, recycling, surplus chemical exchange, and waste treatment. The program is tailored to meet Executive Order 12780, DOE Orders, RCRA, and EPA guidelines. All wastes at Hanford, including radioactive, mixed, hazardous, and nonhazardous regulated wastes, are included in the Hanford Pollution Prevention Program. Reductions in the volumes of radioactive wastes generated have been achieved through methods such as intensive surveying, waste segregation, recycling, and the use of administration and engineering controls.

Spent Nuclear Fuel. [Text deleted.] Two spent nuclear fuel EISs were prepared that will eventually define the management of spent nuclear fuel at Hanford. The first is the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Program Final Environmental Impact Statement* (DOE/EIS-0203-F) referred to in Section 4.2.1, which led to a ROD published in June 1995 (60 FR 28680) and amended in March 1996 (61 FR 9441). That ROD specifies what spent nuclear fuel will be managed at Hanford, INEL, and SRS. Hanford production reactor fuel will remain at Hanford. As of 1995, Hanford has 2,133 metric tons (t) (2,351 short tons [tons]) or 81 percent of the total DOE existing spent fuel inventory. The published ROD projects 12 shipments (either truck or rail) of non-Hanford production reactor spent fuel will be sent to INEL. Each shipment, either by truck or by rail, was assumed to consist of one shipping container. Hanford would not receive any additional fuel. As a result of this action, and assuming no final disposition, by the year 2035 Hanford would have 2,132 t (2,350 tons), or 78 percent, of the total existing DOE redistributed and newly generated inventory in the form of production reactor spent nuclear fuel (61 FR 9441).



Note: DST=Dual Storage Tanks
Source: HF DOE 1995d.

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Figure E.2.1–1. Tank Waste Management at Hanford Site.

A follow-on tiered, site-specific NEPA analysis for the management of the spent nuclear fuel from the K-Basins was published in the January 1996, *Final Environmental Impact Statement on the Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington* (DOE/EIS-0245). Based on the analysis a ROD was published in March 1996 (61 FR 10736). The decision consists of removing the spent nuclear fuel from the basins, vacuum drying, conditioning and sealing the spent nuclear fuel in inert-gas filled canisters for dry vault storage in a new facility, to be built at Hanford, for up to 40 years pending decisions on ultimate disposition. The K-Basins will continue to be operated during the period over which the decision is implemented. If possible, the basin sludge will be transferred to the double-shell tanks for management. If not possible, the basin sludge will continue to be managed as spent nuclear fuel, or disposed of as solid TRU waste. Non-spent nuclear fuel debris will be disposed of in the low-level burial ground at Hanford. The spent nuclear fuel will be loaded in multicanister overpacks that are already in transportation casks, then the multicanister overpacks will be drained and vacuum dried.

Spent nuclear fuel is presently located in 11 facilities at Hanford: 105-KE and 105-KW basins in the 100 Area at the north end of Hanford; T-Plant, LLW burial grounds, and Plutonium Finishing Plant (PFP) in the 200 West Area; Plutonium and Uranium Recovery through Extraction (PUREX) Plant in the 200 East Area; Fast Flux Test Facility (FFTF) in the 400 Area; and Buildings 308, 324, 325, and 327 in the 300 Area at the southeast corner of the site (DOE 1995o:3-3). A summary of the inventory of spent nuclear fuel is shown in Table E.2.1–1.

As of December 1994, the following spent nuclear fuel and associated facilities are at Hanford:

- **N-Reactor Spent Nuclear Fuel.** Zirconium-alloy-clad metallic uranium fuel stored in water in the 105-KW and 105-KE basins and exposed to air in the PUREX Plant dissolver cells A, B, and C.

- **Single-Pass Reactor Spent Nuclear Fuel.** Aluminum-clad metallic uranium fuel stored in water in the 105-KE and 105-KW basins and stored in water in the PUREX Plant basin.

- **Shippingport Core II Spent Nuclear Fuel.** Zirconium-alloy-clad uranium dioxide fuel stored in water in T-Plant canyon pool cell 4.

- **Fast Flux Test Facility Spent Nuclear Fuel.** Stainless steel-clad fuel stored in liquid sodium at the FFTF, consisting mostly of Pu and uranium oxide fuel, but also uranium and Pu metals, and carbide and nitride fuel.

- **Miscellaneous Commercial and Experimental Spent Nuclear Fuel.** Consisting mainly of zirconium-alloy-clad uranium dioxide fuel stored in air in Buildings 324, 325, and 327; training, research, and isotope reactors (built by General Atomics [TRIGA]) fuel stored in water in Building 308; miscellaneous fuel stored in air-filled shielded containers at the 200 West Area burial grounds; and aluminum-clad, uranium-aluminum alloy fuel stored in air in the PFP.

Hanford has developed a *Site Integrated Stabilization Management Plan* (WHC-EP-0853, August 1995) identifying the plans for placing spent nuclear fuel and other Pu-bearing materials in safe interim storage.

High-Level Waste. HLW at Hanford was generated from the reprocessing of production reactor fuel for the recovery of Pu and uranium for defense and other national programs of spent reactor fuel and irradiated targets. HLW has been accumulating at Hanford since 1944. Most of this HLW has undergone one or more treatment steps (for example, neutralization, precipitation, decantation, or evaporation) and will eventually require incorporation into a stable, solid medium (for example, glass) for final disposal. The HLW came from many different processes and sources and has been processed and transferred among tanks so that chemical and physical characteristics of the wastes vary greatly among tanks and even within individual tanks.

Hanford HLW is stored in underground carbon-steel tanks and consists of alkaline liquid, sludge, and salt cake in single-shell tanks; slurry in double-shell tanks; and Cs and strontium (Sr) salts in double-metal alloy capsules. HLW, TRU waste, and liquid mixed LLW were stored in single-shell tanks. These tanks eventually developed leaks and double-shell tanks were built to replace them. Liquids were drawn from the single-shell tanks, concentrated, and pumped to the double-shell tanks to be held for further processing. Sludge, salt cake, and interstitial liquid remains in the single-shell tanks, as they are not readily retrievable. Plans to remove and process this waste are being made. Some of these tanks presented special hazardous conditions because of the generation of explosive gases or the generation of excessive heat that required the addition of water for active cooling, while the tank continues to leak. These "watch list tanks" are being continuously monitored, and remedies are provided until such time as the waste can be removed and processed. There is not sufficient volume in the double-shell tanks to handle the process storage requirements for cleanup of the single-shell tank waste. Additional double-shell tanks and other liquid storage facilities are being designed, and processes are being developed to treat these wastes for disposal. The management and disposition of Hanford's tank waste, and encapsulated strontium and cesium will be in accordance with decisions resulting from the *Final Environmental Impact Statement for the Tank Waste Remediation System* (DOE/EIS-0189).

Between 1956 and 1990, the PUREX Plant processed irradiated reactor fuel to extract Pu and uranium. The PUREX process was a solvent extraction process that used a tributyl phosphate in a kerosene-like solvent for recovering uranium and Pu from nitric acid solutions of irradiated uranium. The waste from the PUREX process was placed in double-shell tanks after 1970. In December 1992, DOE decided to deactivate the PUREX Plant.

All wastes contained in double-shell tanks consist of mixtures of HLW, TRU waste, and LLW, and are managed as if they contain HLW. The aging waste storage unit comprises four double-shell tanks in the 241-AY (Tanks 241-AY-101 and -102) and 241-AZ (Tanks 241-AZ-101 and -102) tank farms in the 200 East Area of Hanford.

There are currently 261,700 m^3 (342,291 yd^3) of HLW stored as alkaline liquid (24,900 m^3 [6.5 million gal]), sludge (46,000 m^3 [60,166 yd^3]), and salt cake (93,000 m^3 [121,639 yd^3]) in single-shell tanks; slurry (97,800 m^3 [127,918 yd^3]) in double-shell tanks; and as Cs and Sr salts in double-metal alloy capsules (DOE 1994c:48). The single-shell tank wastes make up 95 percent of the Hanford mixed HLW. The single-shell tanks consist of 149 tanks containing approximately 136,600 m^3 [178,666 yd^3] of waste (HF DOE 1995d:3-14). The wastes in the single-shell tanks are multi-phased: most is sludge with interstitial liquids; some is in the form of crystalline solids, along with some supernatant liquids.

Eighty-three of the single-shell tanks are located in the 200 West Area and 66 are in the 200 East Area. One hundred thirty-three of the tanks are 22.9 meters (m) (25 yards [yd]) in diameter with nominal capacities between 2,000 and 3,800 m^3 (2,616 and 4,970 yd^3). Sixteen tanks are 6.1 m (7 yd) in diameter with capacities of 210 m^3 (275 yd^3). The single-shell tanks wastes are scheduled under the Tri-Party agreement to be retrieved and vitrified in the same manner as the double-shell tanks wastes. The single-shell tanks will be closed in accordance with schedules negotiated in the Tri-Party Agreement.

Twenty-eight double-shell tanks, each with a 4,300 m^3 (5,624 yd^3) capacity, stored 78,706 m^3 (102,944 yd^3) of waste as of December 31, 1994. The double-shell tanks do not simply accumulate and store waste; the tanks are a waste-handling system. The inflows to the double-shell tank system include supernate and interstitial liquids pumped from single-shell tanks, laboratory wastes, dilute wastes from across Hanford, and waste from inactive facilities. Outflows include waste destined for evaporation and future pretreatment and vitrification processes. Evaporation decreases the double-shell tank waste volume; pretreatment and vitrification remove double-shell tank waste and prepare it for disposal. The wastes in double-shell tanks consist of solids and liquids. Typically, the solids fraction has settled out as a sludge layer. LLW, TRU waste, and HLW are further designated as ignitable, corrosive, toxic, persistent, and carcinogenic extremely hazardous waste. Many RCRA-listed waste codes are also present. Because of heavy metals contamination, double-shell tank waste also is designated as toxic by the toxicity characteristic leaching procedure. Treatment plans are to recover the contents of the tanks, separate the waste into high- and low-level fractions, and immobilize them for disposal. The TRU and high-level fractions will be vitrified for disposal in a geologic repository; the low-level fraction would be disposed of onsite in near-surface retrievable disposal vaults covered with a thick earthen barrier following evaporation and vitrification. The 242-A evaporator is a key unit in volume minimization with this process. This unit was out of service but was restarted in April 1994 after upgrades were completed. The 242-A evaporator will be replaced by the 242-H evaporator when the new liquid effluent retention facility has been completed, replacing the practice of discharge of evaporator effluent to the soil column.

Cesium and strontium salts in double-metal alloy capsules (commonly referred to as cesium [Cs-137] and strontium [Sr-90] capsules) are part of the current HLW inventory. From 1968 to 1985, most of the high-heat-emitting nuclides (Sr-90 and Cs-137, plus their daughter products) were extracted from the old tank waste, converted to solids (strontium fluoride and cesium chloride [CsCl]), placed in double-walled metal cylinders (capsules) about 50 centimeters (cm) (20 inches [in]) in length and 5 cm (2 in) in diameter, and stored in the Waste Encapsulation and Storage Facility in water-filled pools.

The total number of Cs capsules produced is 1,577. As of August 19, 1993, the number of known dismantled Cs capsules is 249. These have been put to beneficial use and are not expected to be returned. The total number of remaining capsules requiring disposal is 1,328. Of the 1,328 remaining capsules, 959 are in storage at Hanford and 369 capsules have been leased for beneficial use. One of these capsules developed a small leak, and others have shown signs of bulging, so current plans are to bring all leased capsules back to Hanford (DOE 1995o:4-119).

The total number of Sr capsules produced is 640. As of August 19, 1993, the number of known dismantled Sr capsules was 35. These have been put to beneficial use and are not expected to be returned. The total number of remaining capsules requiring disposal is 605. Of the 605 remaining capsules, 601 are in storage at Hanford, and 4 have been leased offsite for beneficial use (DOE 1995o:4-119).

Therefore, at present 1,328 Cs capsules (2.47 m^3 [3.23 yd^3]) and 605 Sr capsules (1.08 m^3 [1.41 yd^3]) require storage. Nine hundred and fifty-nine Cs capsules and 601 Sr capsules are stored in pools of water in the Waste Encapsulation and Storage Facility. The capsules will be stored at Hanford until they can be transported to a proposed national repository (DOE 1995o:4-120). Tables E.2.1–2, E.2.1–3, and E.2.1–4 list HLW inventories and treatment and storage facilities at Hanford.

Transuranic Waste. TRU waste is primarily generated by R&D activities, Pu recovery, environmental restoration, and D&D. Most TRU waste is in solid form (for example, protective clothing, paper trash, rags, glass, miscellaneous tools, and equipment). Some TRU waste is in liquid form (sludges) resulting from chemical processing for recovery of Pu or other TRU elements.

Before 1970, all DOE-generated TRU waste was disposed of onsite in shallow, unlined trenches. From 1970 to 1986, TRU wastes were segregated from other waste types and disposed in trenches designated for retrieval. Since 1986, all TRU waste has been segregated and placed in retrievable storage pending shipment and final disposal in a permanent geologic repository.

Currently, all TRU wastes are stored in above-grade storage facilities in the Hanford Central Waste Complex and Transuranic Waste Storage and Assay Facility. The plan is to ship the stored TRU waste to WIPP near Carlsbad, New Mexico, for final disposal once WIPP can demonstrate compliance with 40 CFR 191 and 40 CFR 268. Current planning calls for all shipments to WIPP to be managed through module 1 of the Waste Receiving and Processing Facility or the proposed module 2B of the Waste Receiving and Processing Facility. If WIPP proves unsatisfactory as a TRU waste disposal facility, then another disposal facility would be selected. Should additional treatment be necessary for the disposal of TRU wastes, then Hanford would develop the appropriate treatment capability. Table E.2.1–5 lists the TRU and mixed TRU waste inventories. Tables E.2.1–6 and E.2.1–7 present the TRU and mixed TRU waste treatment and storage facilities at Hanford.

Low-Level Waste. From 1944 to 1991, approximately 558,916 m^3 (731,034 yd^3) of LLW was buried at Hanford (DOE 1995o:4-123). Between 1944 and 1986, no differentiation was made between LLW and mixed LLW.

Solid LLW is currently placed in unlined, near-surface trenches at the 200 Area LLW Burial Grounds. The site continues to receive LLW from offsite generators for disposal. Major sources of this waste are the Puget Sound Naval Shipyard in Washington, Brookhaven National Laboratory in New York, and Lawrence Berkeley Laboratory in California. Other points of origin include DOE facilities at nuclear power stations in Shippingport, Pennsylvania; Bechtel in Albany, Oregon; and Wood River in Charleston, Rhode Island. U.S. Ecology operates a licensed commercial LLW burial ground at Hanford on a site that is leased to the State of Washington. Although physically located on Hanford, it is not considered part of Hanford. The commercial LLW burial ground site area comprises 40 ha (99 acres), of which 29.5 ha (73 acres) are considered usable, with 11.9 ha (29 acres) used by the end of 1991. Through 1991, 338,500 m^3 (442,741 yd^3) of LLW had been disposed of at this site (DOE 1995o:4-123).

The LLW resulting from the tank waste remediation system waste pretreatment program will be vitrified by the end of 2035, under the tank waste remediation system LLW (vitrification) program. As a near-term contingency, the grout facility will be maintained in a standby condition. The program will utilize commercially available melters and other key processing technologies as much as possible. The program has contracts in place with several commercial melter vendors, and melter tests with Hanford waste simulants are currently being conducted. From the results of these tests, the reference melter and reference low-level glass formulation will be selected and incorporated into the design of the LLW vitrification facility. The current program baseline calls for the following: (1) initiation of hot operations of the LLW vitrification facility by June 2005 and (2) completion of vitrification of Hanford tank LLW by December 2035. The vitrified LLW will be disposed of onsite in the 200 Areas at Hanford by the tank waste remediation system program.

Mixed Low-Level Waste. Mixed LLW includes a variety of contaminated materials, including air filters, cleaning materials, engine oils and grease, paint residues, photographic materials, soils, building materials, and decommissioned plant equipment. The following special nuclear material production and site restoration activities have generated, or may generate, mixed waste:

- Fabrication of reactor fuel elements
- Operation of the production reactors
- Processing of irradiated fuel
- Separation and extraction of Pu and uranium
- Preparation of Pu metal
- Environmental restoration
- R&D support projects
- Maintenance and operations support

Between 1987 and 1991, 16,745 m^3 (21,901 yd^3) of mixed LLW were buried at Hanford (between 1944 and 1986, no differentiation was made between LLW and mixed LLW). Another 4,225 m^3 (5,526 yd^3) of mixed waste has been accumulating in storage in the Central Waste Complex, located in the 200 West Area (DOE 1995o:4-123).

Hanford also receives defueled submarine reactor compartments that are contaminated with PCBs and lead. These compartments are managed as mixed waste. In 1993, seven defueled submarine reactor compartment disposal packages were received and placed in Trench 94 of the 200-East Area LLW waste burial grounds. The Naval Nuclear Propulsion Program will prepare an EIS for its proposal to bury additional reactor compartments at Hanford. As of November 1993, there were a total of 35 submarine reactor compartments stored in Trench 94.

In 1993, 5,260 m^3 (6,880 yd^3) of mixed LLW were generated. The 78 mixed LLW streams at Hanford make up 85,000 m^3 (111,175 yd^3) of the mixed LLW. Ninety-six percent of the total is beta/gamma-emitting waste, mostly in the form of aqueous liquid in the double-shell tanks. One stream (double-shell tank miscellaneous waste) accounts for 40,000 m^3 (52,318 yd^3) of the mixed LLW, and in combination, the double-shell tank double-shell slurry feed, double-shell tank complex concentrate, and double-shell tank double-shell slurry make up another 34,500 m^3 (45,124 yd^3). Three mixed LLW streams related to the 183-H solar evaporation basin cleaning contain 2,500 m^3 (3,269 yd^3) (DOE 1995o:4-121). These inorganic sludge/particulate wastes have been neutralized and treated for packaging.

It is expected that 49 percent of all the mixed LLW at Hanford cannot be treated until the technology is modified or verified. The remaining 51 percent is to be processed through the 242-A Evaporator (a closed system in which distillates are passed through an ion-exchange system to remove Cs). Treatment for these wastes is being evaluated as part of the design of the Effluent Treatment Facility (ETF) and the Waste Receiving and Processing Facility. The Waste Receiving and Processing Facility, to be located near the Central Waste Complex, would provide size reduction, decontamination, condensation, melting, amalgamation, incineration, ash stabilization, and shipping for Hanford mixed waste. The Waste Receiving and Processing Facility will be constructed in two phases: module 1 and module 2 (2A and 2B). The separation of module 2 into the 2A and 2B components has not been formally approved through the Tri-Party Agreement change request process. Module 1 will be designed to prepare retrieved and stored TRU and would be operational in 1999. Module 2A, or the proposed commercial treatment alternative, would be designed to process LLW, TRU wastes, mixed LLW, and mixed TRU wastes, and would be operational in 1997. Module 2B, if authorized, would be designed to process LLW, TRU wastes, mixed LLW, and mixed TRU wastes with a dose rate greater than 200 millirem (mrem)/hour (hr). Module 2B has an undetermined startup date. Other technologies and plans are also being considered and will be the subject of appropriate NEPA documentation during the selection process. In a recent modification to the Tri-Party Agreement, DOE has agreed to begin design of a vitrification facility to treat liquid mixed LLW in the future.

[Text deleted.]

The RCRA components of mixed waste at Hanford are mainly the following listed wastes: D002B (alkaline liquids, 22 streams), D006B (cadmium, 29 streams), D007 (chromium, 34 streams), D008B (lead, 30 streams), and F003 (nonchlorinated solvents, 30 streams). Waste sources are primarily the separation and extraction processes that were used to produce special nuclear material. Inventory, treatment, disposal, and storage facilities for LLW and mixed LLW are listed in Tables E.2.1–8, E.2.1–9, E.2.1–10, and E.2.1–11.

Hazardous Waste. Hazardous wastes are categorized by Washington Administrative Code, *Dangerous Waste Regulations*, as dangerous waste and extremely hazardous waste. As of March 15, 1993, Hanford contained 64 interim-status treatment, storage, or disposal units. Present plans are that final RCRA permits will be sought for 24 of these 64 units, 34 units will be closed, and 6 units will be dispositioned through other regulatory options. Future circumstances may cause these numbers to change. The treatment, storage, or disposal units within the Hanford facility include, but are not limited to, tank systems, surface impoundments, container storage areas, waste piles, landfills, and miscellaneous units. Other RCRA permits, such as research, development, and demonstration permits (for example, the 200 Area Liquid ETF), are also being pursued. A summary of the hazardous waste treatment and storage facilities at Hanford is shown in Tables E.2.1–12 and E.2.1–13.

The principal present waste management practice for newly generated hazardous waste is to ship it offsite for treatment, recycling, recovery, and disposal. Table E.2.1–14 lists the hazardous waste quantities shipped offsite in 1994. The Nonradioactive Dangerous Waste Storage Facility (Building 616) and the 305-B waste storage facility are the only active facilities storing hazardous waste (other than the less-than-90-day storage areas and two boxes (one containing mixed and one containing hazardous waste) stored in the 222-S laboratory complex).

Nonhazardous (Sanitary) Waste. Onsite treatment facilities (such as septic tanks, subsurface soil absorption systems, and a sanitary treatment plant) treat an average of 0.60 million l (0.158 million gal) of sewage per day (DOE 1995cc:4-55). The 200 Area Treated Effluent Disposal Facility industrial sewer will collect the treated wastewater streams from various plants in the 200 Areas and dispose of the clean effluent at two new 20,235-square meters (m^2) (5-acre) ponds permitted by the State of Washington. The 300 Area Treated Effluent Disposal Facility provides collection, treatment, and disposal for laboratory wastewater, boiler blowdown, steam condensate, spent softener regenerant, and heating, ventilation, and air conditioning generated in the 300 Area. The treated wastewater is discharged to the Columbia River under the conditions of a NPDES permit. Solid wastes are disposed of in the 600 Area Central Landfill. Coal waste is disposed of in landfills near the 200 East and 200 West Area powerhouses. A quantity of 246,051,000 l (64,999,793 gal) of liquid sanitary waste and 43,006 m^3 (56,249 yd^3) of solid sanitary waste are estimated to be generated each year at Hanford.

Other Nonhazardous Wastes. Solid wastes are generated in all areas of Hanford. Nonhazardous solid wastes include the following:

- Construction debris, office trash, cafeteria waste/garbage, empty containers and packaging materials, medical waste, inert materials, bulky items such as appliances and furniture, 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 (regulated under CAA)

- Ash generated from powerhouses

- Nonradioactive demolition debris from decommissioning projects

The active Hanford Site Solid Waste Landfill, located in the 200 Area, began operation in 1973. In 1992, 22,213 m^3 (29,053 yd^3) of solid waste and 1,017 m^3 (1,330 yd^3) of asbestos were deposited in the solid waste section of the landfill (DOE 1995o:4-127). Pit 10 was opened for disposal of inert material as defined in Washington Administrative Code 173-304, and 11,389 m^3 (14,896 yd^3) of waste were disposed of there. The landfill is currently scheduled for closure in 1997.

Table E.2.1–1. Spent Nuclear Fuel Inventory at Hanford Site

Storage Facility	Spent Nuclear Fuel Source/Type	1995 Heavy Metal Volume (m^3)	1995 Discharged Heavy Metal (t)[a]
Area 200	Miscellaneous Fuel Residues	21.77	0.33
Bldg. 308	Training Reactor Isotopes, General Atomics	0.08	0.02
Bldgs. 324,325, 327	DOE and Commercial Fuel	1.30	2.30
Fast Flux Test Facility	Fast Flux Test Facility driver fuel, assemblies and test driver fuel assemblies	16.51	11.01
PUREX	N-Reactor Mark and 1A Fuel	0.23	3.14
T-Plant	Shippingport PWR Core II	9.45	15.82
105-K East Basin	N-Reactor	112.05	1,146.34
105-K West Basin	N-Reactor	93.22	953.89
Hanford Mass Total		254.61	2,132.85

[a] For spent fuel, mass is reported to provide better assurances of accountability. Spent fuel is reported in units of metric tons of initial heavy metal (original mass of the actinide elements of the fuel) to avoid difficulties and confusion arising from the need to estimate ranges of varied heavy-metal content that result from different levels of enrichment and reactor fuel burnup.

Source: DOE 1995kk.

Table E.2.1–2. High-Level Waste Inventory at Hanford Site

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1994 (m^3)	Number of Waste Streams, 5-Year Projection	Total Generation, 5-Year Projection (m^3)
Remote-Handled				
Aqueous liquids slurries	8	64,507	4	89,116
Organic liquids	2	14,194	1	2,029
Inorganic process residues	1	160,240	1	0
Total	11	238,941	6	91,145

Source: DOE 1995gg.

Table E.2.1–3. High-Level Waste Treatment Facilities at Hanford Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m³/yr)	Comment
242-A Evaporator	Evaporation, ion exchange (Cs removal)	HLW aqueous liquid	HLW sludge, salt, slurry	50,000	The 242-A was restarted April 1995 after upgrades were completed.
Waste Vitrification Plant	Vitrification	HLW aqueous slurry liquid, inorganic sludge/particulate	HLW solid borosilicate glass	2,190	Planned available 1999
244 AR Vault	Liquid/solid separation (decanting) pretreatment of PUREX HLW and neutralized cladding removal waste	HLW, mixed TRU liquid sludge, contact- handled, corrosive, TCLP	HLW sludge to vitrification at the Hanford Waste Vitrification Plant, HLW supernate to B-Plant polishing filtration	Planned	Planned but not funded.

[a] For those facilities in use a normal operating capacity; whereas, for facilities under design or construction this is a design capacity. Schedules and capacities for facilities under or construction are subject to changes based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1993h; DOE 1994k; DOE 1995gg.

Table E.2.1–4. High-Level Waste Storage Facilities at Hanford Site

Storage Unit	Input Capability	Total Capacity[a] (m³)	Comment
241-AN Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	30,410	Operational
241-AP Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	34,640	Operational
241-AW Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	25,980	Operational
241-AY Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	7,570	Operational
241-AZ Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	7,570	Operational
241-SY Tank Farm	HLW, mixed LLW, mixed-TRU corrosive, TCLP, ignitable, listed, reactive liquid sludge	12,990	Operational

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.

Source: DOE 1994k.

Table E.2.1–5. ***Transuranic and Mixed Transuranic Waste Inventory at Hanford Site***

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1994 (m^3)	Number of Waste Streams, 5-Year Projection	Total Generation, 5-Year Projection (m^3)
Homogeneous Solids				
TRU	4	4.28	3	2.5
Mixed-TRU	2	0.63	0	0
Soil/Gravel				
TRU	4	74.59	1	612.73
Mixed-TRU	2	11.93	1	0.83
Debris Waste				
TRU	81	10,760.48	27	1,169.65
Mixed-TRU	61	258.40	29	131.46
Lab Packs				
TRU	0	0	0	0
Mixed-TRU	3	4.30	2	8.11
Special Waste				
TRU	0	0	0	0
Mixed-TRU	5	3.27	1	21.36
Total TRU	89	10,839.35	31	1,784.88
Total Mixed-TRU	73	278.53	33	161.76
Total	162	11,117.88	64	1,946.64

Source: DOE 1995gg.

Table E.2.1–6. ***Transuranic and Mixed Transuranic Waste Treatment Facilities at Hanford Site***

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3)	Comment
Waste Receiving and Processing Facility 1	Repacking	Solid mixed TRU, TRU, mixed LLW, LLW, corrosive, ignitable, listed, reactive, TCLP	Containerized LLW to low- level burial grounds, WIPP-certified TRU and mixed TRU to WIPP, containerized mixed LLW to storage/treatment	1,870	Startup planned 3/97 for LLW only.
Waste Stabilization Contract	Stabilization and repackaging	Solid mixed LLW, corrosive, ignitable, listed, reactive, TCLP	Containerized mixed LLW to containerized mixed waste disposal facility	9,000	Treatment beginning in 1999.
Waste Thermal Treatment Contract	Thermal Treatment, Stabilization, Vitrification	Solid mixed LLW, corrosive, ignitable, listed, reactive, TCLP	Containerized mixed LLW to containerized mixed waste disposal facility	5,000	Planned treatment beginning 2001.

[a] For those facilities in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to change based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994k; DOE 1995gg.

Table E.2.1–7. Transuranic and Mixed Transuranic Waste Storage Facilities at Hanford Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Central Waste Complex	Solid mixed TRU waste and TRU waste (remote-handled), mixed LLW and LLW, PCBs, corrosive, TCLP, ignitable, listed, reactive	22,710	Operational, RCRA Part B Interim Status
Retrievable Storage Units	Solid mixed TRU waste (contact-handled) and mixed LLW, corrosive, TCLP, ignitable, listed, reactive	1,171,938	Operational, RCRA Part B Interim Status
TRU Waste Storage and Assay Facility	Solid mixed TRU waste and TRU waste (remote-handled), corrosive, TCLP, ignitable, listed, reactive	416	Operational, RCRA Part B Interim Status

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.

Source: DOE 1994k.

Table E.2.1–8. Mixed Low-Level Waste Inventory at Hanford Site

Waste Matrix	Number of Waste Streams	Inventory as of December 31, 1994 (m^3)	Number of Waste Streams, 5-Year Projection	Total Generation, 5-Year Projection (m^3)
Organic liquids	1	0.21	0	0
Homogeneous solids	47	2,657.47	23	1,466
Soil/gravel	21	459.06	13	541.20
Debris waste	60	2,708.31	32	2,408.50
Lab packs	27	263.45	19	1,016.30
Special waste	15	222.42	7	148.90
Elemental lead	9	210.81	3	133.40
Total	180	6,521.73	97	5,714.30

Source: DOE 1995gg.

Table E.2.1–9. Low-Level Waste and Mixed Low-Level Waste Treatment Facilities at Hanford Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a]	Comment
242-A Evaporator	Adsorption Resin (ion exchange), evaporation	Liquid mixed LLW contact-handled, corrosive, TCLP, ignitable, listed, reactive	Concentrated evaporator bottoms are stored in the double shell tanks. The evaporator distillate is passed through an ion exchange column to remove Cs. Once saturated the ion exchange resin is slurried to the double shell tanks	50,000 m^3/yr	Will be replaced by the 242-H evaporator
Grout Treatment Facility	Solidification	Liquid mixed LLW contact-handled, corrosive, TCLP	Solidified grout LLW, contact-handled, to grout vaults	Design Feedrate: 15,000 m^3/yr	The Grout Treatment Facility processes the waste in campaigns. One campaign is 3,785,400 l of waste (before grouting).
LLW/Low Reading Compactor	Compaction	Solid LLW job waste	Compacted LLW	The unit compacts one (1) 55-gal drum at a time	Operational
LLW Compactor	Compaction	Solid LLW paper, plastic	Compacted LLW	Design feedrate 2 m^3/hr, daily 5 days per week, 8 hr/day	Operational
Maintenance and Storage Facility	Oxidation	Solid mixed LLW, contact-handled, reactive, ignitable	Liquid LLW to grout vault; solid residuals to containerized mixed low-level waste disposal facility	This is a batch treatment system (26 batches/yr maximum) via cask transfer. This process can treat up to 20 l/day of dangerous waste	Operational
Mixed Waste Treatment Facility	Distillation neutralization, solidification	Solid and liquid mixed LLW, contact-handled, listed, TCLP, corrosive	Solid mixed LLW, contact-handled, listed, TCLP to containerized mixed waste disposal facility	Waste are batched into the unit in small volumes, i.e., no container larger than a 55-gal drum	Operational

Table E.2.1–9. Low-Level Waste and Mixed Low-Level Waste Treatment Facilities at Hanford Site—Continued

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a]	Comment
PUREX/242-A Effluent Treatment	Adsorption, evaporation, separation, membrane process oxidation	Liquid mixed LLW, liquid LLW, contact-handled, listed	Liquid mixed LLW sludge, listed	Design feedrate: 34 m^3/hr	Planned and Funded; Date Available; 12/01/94 Termination Date: 06/01/2022
Shielded Analytical Lab Waste Treatment Unit	Neutralization, solidification, precipitation	Liquid mixed LLW, contact-handled, listed, corrosive, TCLP	Liquid, solid mixed LLW, contact-handled, listed, TCLP. Liquid to 204AR, Solid to Central Waste Complex	Design feedrate: 4 kilogram/hr	Operational

[a] For those facilities in use, a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under or construction are subject to changes based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994k.

Table E.2.1–10. Low-Level Waste and Mixed Low-Level Waste Disposal Facilities at Hanford Site

Disposal Unit	Input Capability	Capacity (m^3)	Comment
Grout vaults	Solidified grout, LLW, contact-handled	230,000	Operational, the vaults are covered under the same RCRA permit as the Grout Treatment Facility
Mixed LLW disposal Facility-Project W-025	Solid mixed LLW, solid LLW, listed PCBs, contact-handled	14,200	Construction complete. Facility design is a double-lined trench with a leachate collection system in compliance with RCRA requirements for hazardous waste disposal
LLW Burial Grounds	Solid mixed LLW, solid LLW, contact-handled, reactive, ignitable, listed, corrosive, TCLP	888,109	Operational

Source: DOE 1994k.

Table E.2.1–11. Low-Level Waste and Mixed Low-Level Waste Storage Facilities at Hanford Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
305-B Storage Facility	Liquid and solid mixed LLW, liquid and solid LLW, hazardous waste, PCBs, corrosive, TCLP, ignitable, listed, reactive	20	Operational, RCRA Part B
4843 Alkali Metal Storage Facility	Liquid and solid mixed LLW, reactive, ignitable	83.3	Operational, RCRA Part B Interim status
B-Plant Canyon Waste Pile	Solid LLW, metal	5	Operational, RCRA Part B Interim status
B-Plant Container Storage	Solid mixed LLW, reactive, ignitable, TCLP	51	Operational, RCRA Part B Interim status
PUREX Canyon Waste Pile	Solid mixed LLW, TCLP	432	Operational, RCRA Part B Interim status
PUREX Tunnel 1	Solid mixed LLW, solid LLW, TCLP, metal, contact-handled	4,141	Operational, RCRA Part B Interim status
PUREX Tunnel 2	Solid mixed LLW, solid LLW, TCLP, ignitable, metal, contact-handled	19,528	Operational, RCRA Part B Interim status
Single-Shell Tanks	Mixed LLW, sludge (contact-handled), listed, corrosive, TCLP	347,766	Nonoperational due to pending closure

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.

Source: DOE 1994k.

Table E.2.1–12. Hazardous Waste Treatment Facilities at Hanford Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a]	Comment
Hexone Incineration	Incineration	Liquid hazardous waste, listed, hexone	Incineration off-gas, gas, sanitary	Design feedrate: 0.79 m^3/hr	Planned but not funded
Interim Hazardous Waste Treatment Facility	Distillation, neutralization, solidification	Liquid hazardous waste, listed, corrosive, TCLP	High and low boiling point organics, liquid sanitary waste	Batch treatment	Operational, RCRA Part B Application was submitted August 1992

[a] For those facilities in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994k.

Table E.2.1–13. Hazardous Waste Storage Facility at Hanford Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Nonradioactive dangerous waste storage	Liquid and solid RCRA hazardous wastes, corrosive, ignitable	100.30	Operational, RCRA permit submitted 07/31/1989

[a] Schedules and capacities for facilities under design or construction are subject to changes based on the availability of funds and permit issuance.

Source: DOE 1994k.

Table E.2.1–14. Hazardous Waste Quantities Shipped Offsite in 1994 at Hanford Site

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume (m^3)[a]
Aerosols	13	458	0.5
Barium compounds, n.o.s.	1	<1	<1
Batteries, dry, containing potassium hydroxide solid	5	959	0.6
Caustic alkali liquids, n.o.s.	12	2,386	2.4
Combustible liquids, n.o.s.	11	18,320	18.3
Compounds, cleaning liquid	5	45	<0.1
Compressed gases, flammable, n.o.s.	1	17	<0.1
Corrosive liquids, n.o.s.	12	4,005	4.0
Corrosive solids, n.o.s.	12	3,052	2.0
Environmentally hazardous substances, solid, n.o.s.	123	2,267,942	1,512.0
Flammable liquids, corrosive, n.o.s.	3	10	<0.1
Flammable liquids, n.o.s.	13	1,476	1.5
Flammable liquids, poisonous, n.o.s.	1	<1	<0.1
Flammable solid, n.o.s.	2	70	<0.1
Hazardous waste, liquid, n.o.s.	19	20,956	21.0
Hazardous waste, solid, n.o.s.	44	475,691	317.1
Lead dioxide, n.o.s.	1	53	<0.1
Non-RCRA waste liquid	16	88,426	88.4
Non-RCRA waste solid	13	12,280	8.2
Organic peroxide type B, solid	1	1	<0.1
Organic peroxide type D, liquid	1	10	<0.1
Oxidizing substances, solid, n.o.s.	5	353	0.2
Paint	8	1,659	1.7
Paint related material	5	866	0.6
Poisonous liquids, corrosive, n.o.s.	1	78	<0.1

Table E.2.1–14. Hazardous Waste Quantities Shipped Offsite in 1994 at Hanford Site—Continued

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume (m^3)[a]
Poisonous liquids, n.o.s.	4	70	<0.1
Poisonous solids, corrosive, solid	1	<1	<0.1
Poisonous solid, n.o.s.	3	96	<0.1
Polychlorinated biphenyls	24	224,597	149.7
Sodium	6	286	0.2
Sodium hydroxide, solid	1	3	<0.1
Substances which in contact with water emit flammable gases, solid	1	<1	<0.1
Substances which in contact with water emit flammable gases, liquid	1	<1	<0.1

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 500 kg/m^3 for compressed gases, 1,000 kg/m^3 for liquids, and 1,500 kg/m^3 for solids.

Note: kg=kilogram; n.o.s.=not otherwise specified.

Source: DOE 1995h.

E.2.2 NEVADA TEST SITE

After underground nuclear tests at NTS, radioactive and hazardous materials were extracted and analyzed. These activities have resulted in the accumulation of low-level, hazardous, and mixed wastes that must be treated, stored, and disposed of. The *Site Book for Waste Management* (May 1994), the *Waste Management Plan for the Nevada Test Site* (February 1995), the *NTS Site Treatment Plan and Federal Facility Compliance Act Consent Order* (March 1996), and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/EIS 0243) (NTS Site-Wide EIS) detail waste management activities at NTS.

Radioactive and hazardous wastes (according to the current definition of hazardous wastes) generated from past nuclear testing activities were disposed of in Areas 2, 3, 5, 6, 8, 9, 12, and 23. These were mixed wastes and LLW composed of debris, drilling mud, decontamination wastes, laboratory, and classified wastes. Areas 3 and 5 are still currently active for waste storage and disposal. Area 3 receives offsite and onsite bulk waste for disposal in subsidence craters. An RCRA closure plan for this facility has been submitted to the Nevada Division of Environmental Protection. The Radioactive Waste Management Site in the north of Area 5 contains LLW management units and receives packaged classified and unclassified LLW. NTS also has TRU waste from Lawrence Livermore National Laboratory (LLNL) in storage and a hazardous waste storage unit. The NTS currently is not accepting mixed wastes from any locations. Mixed waste could be accepted from Defense-related generators within the State of Nevada; however, there is no mixed waste ready for disposal that meets the land disposal restrictions of RCRA. Mixed waste from out-of-state generators has been disposed at NTS in the past. This practice is planned for the future contingent on approval and permitting (RCRA Part B) of future mixed waste disposal units and on actions resulting from the ROD for the Waste Management PEIS.

In the past, NTS hazardous waste was disposed of in landfills, through underground injection, in leachfields, and offsite. A goal of the NTS Environmental Restoration Project is to remove or immobilize hazardous substances, pollutants, and contaminants while achieving compliance with environmental laws and regulations. Environmental restoration activities will be guided by the ROD from the NTS Site-Wide EIS and the NTS Site Treatment Plan.[Text deleted.]

Pollution Prevention. The DOE Nevada Operations Office is an active participant in DOE's national waste minimization and pollution prevention program. A comprehensive waste minimization plan for NTS, completed in 1991, defines specific goals, methods, responsibility, and achievements for organizations. A waste minimization organization promotes waste minimization and pollution prevention and ensures compliance with DOE orders at NTS. A report on waste generation and waste minimization progress is published annually.

The DOE Nevada Operations Office publishes sitewide plans and guidance, and each contractor develops its own implementation plan. Plans and procedures have been developed limiting the number and types of hazardous materials used on the site. Since initiation of the waste minimization program, several steam-cleaning operations have been eliminated, and half of the hazardous solvents used at NTS have been replaced with nonhazardous solvents. Recycling and reclamation activities have been established to reuse lead, silver, lubricating oil, and trichlorotrifluoroethane. Automatic decontamination equipment, recycling fabrication tool coolant systems, and continuous oil change and reburn systems have been placed in service to reduce hazardous waste generation. Closed-loop effluent recycling for steam cleaning has eliminated the production of 17.8 million l (4.7 million gal) of wastewater annually and reduced hazardous waste generation by 90 percent. Two solvent waste stills recycle 85 percent of all solvents and thinners used. Nonhazardous aqueous solution parts cleaners have eliminated the need for parts cleaning solvents.

The procurement of all materials is also reviewed for the opportunity to reduce the purchase of hazardous materials for NTS operations. [Text deleted.] In addition, an education and training program for all site personnel and for the surrounding community is helping to increase awareness of practices and lessons learned in waste reduction.

Transuranic Waste. TRU and mixed TRU waste at NTS, which was generated at LLNL and shipped to NTS between 1974 and 1990, is stored on the TRU Waste Storage Pad in Area 5. All NTS TRU and mixed TRU waste is expected to be certified for disposal at WIPP in Carlsbad, NM, or at another suitable repository should WIPP prove to be unsatisfactory. The DOE Nevada Operations Office has the option to construct a TRU Waste Certification Building for breaching, sampling, and certifying containers of TRU waste to meet the WIPP waste acceptance criteria, which is expected to be finalized by June 1997 (NT DOE 1996b:BV-37). Other technologies, such as mobile characterization capabilities, are also being considered. This waste inventory consists of 612 m^3 (800 yd^3) of heterogeneous debris. The TRU waste is stored in the TRU Pad Cover Building on the TRU Waste Storage Pad to protect the containers from the environment. [Text deleted.] In addition, TRU and suspected TRU wastes from weapons tests were emplaced in boreholes. Decisions to retrieve this waste or leave it in place will be based on performance assessments required by 40 CFR 191 and/or on risk assessments required by the *CERCLA National Contingency Plan* or RCRA corrective action. Table E.2.2–1 lists the mixed TRU waste storage units at NTS.

Low-Level Waste. Contaminated soils created from past atmospheric nuclear weapons tests occur at various locations on NTS. Some of this surface contamination has been, or is planned to be, removed and disposed of as waste. Although the debris from underground weapons tests remains underground, samples of this debris brought to the surface for analysis must be disposed of as waste. The majority of LLW generated at NTS is disposed in subsidence craters in Area 3. This area also receives substantial quantities of containerized bulk waste from offsite DOE facilities. Some waste disposal units are being closed in this area, while others are being readied for future use. Area 5 receives low-level radioactive waste from both onsite and offsite generators. New disposal capacity is planned for this area, and the offsite generators will be required to meet the NTS waste acceptance criteria (which includes periodic reviews by the DOE Nevada Operations Office) to permit them to ship LLW for disposal at NTS.

Historically, the volume of waste received from offsite is approximately equal to or slightly greater than the volume of waste generated onsite. Onsite waste generation (other than environmental restoration waste) has declined due to cessation of nuclear testing with offsite receipts now dominating waste disposal activities. Remediation activities at NTS will produce waste streams that will have to be treated, stored, and disposed. Any incoming offsite waste shipments must meet NTS waste acceptance criteria. Fifteen generators currently ship LLW to NTS and nine additional generators are applying or are waiting for approval (NT DOE 1996c:4-48,4-49). The LLW disposal capacity in use or planned at NTS is listed in Table E.2.2–2.

Mixed Low-Level Waste. Mixed LLW is generated by Defense-related support activities, environmental restoration activities, and activities supporting TRU waste disposal at WIPP or at another suitable repository should the WIPP prove to be unacceptable. Wastes were generated by the analytical activities supporting weapons tests and consist of drilling muds and debris generated from tunnel reentry and rehabilitation. Additional wastes result from radiochemical analysis and from the decontamination of equipment and facilities used in sample extraction and analysis. NTS has received mixed wastes from other DOE sites and may receive additional waste in the future, pending the completion of the Site Treatment Plans for all DOE sites and issuance of proper permits. Mixed waste generated in the State of Nevada that meets the land disposal restrictions of RCRA can be disposed of in the Area 5 Mixed Waste Disposal Unit, Pit 3. Mixed wastes not meeting the land disposal restrictions requirements can be stored on the TRU Waste Storage Pad. A RCRA Part B Permit application for a new mixed waste storage unit was submitted in January 1995. Mixed LLW streams are being characterized to fully determine what technologies and capabilities are required for safe, environmentally sound, and compliant disposal. [Text deleted.]

Table E.2.2–2 lists mixed LLW storage and disposal facilities at NTS. Table E.2.2–3 lists the mixed LLW streams inventory and 5-year projected generation at NTS. The total volume is 296 m^3 (388 yd^3), including a 20,425-kilogram (kg) (45,000-pound [lb]) empty spent shipping cask. [Text deleted.]

Hazardous Waste. Hazardous waste is generated from ongoing operations at NTS. This waste consists of solvents, lubricants, fuel, lead, metals, and acids and is accumulated at various sites around NTS while awaiting shipment offsite to an RCRA-permitted facility. Over the next 5 years, additional satellite storage locations are planned. A separate accumulation site is located across the road from Area 5 to avoid potential cross-contamination with radioactive waste. The generation of hazardous waste at NTS is expected to decrease significantly because of the cessation of nuclear testing, the completion of environmental restoration activities, and the impact of waste minimization activities. Hazardous waste is stored on a 279-m^2 (365-square yard [yd^2]) covered pad in Area 5 (NT REECO 1995a:33).

Nonhazardous Waste. Nonhazardous sanitary waste is expected to be generated at the current rate for several more years, then at a lower rate due to the cessation of nuclear weapons testing. Recycling of paper, metals, glass, plastics, and cardboard has already resulted in some decrease in waste quantities. NTS has several sanitary landfills and construction landfills in operation.

Table E.2.2–1. Mixed Transuranic Waste Storage Facility at Nevada Test Site

Storage Unit	Input Capability	Total Area (m^2)	Comment
Asphalt Storage Pad	Mixed TRU solid, mixed LLW	8,300 (1,995 in TRU pad cover building)	Available storage capacity on the TRU Pad to be used for storage of future, onsite-generated mixed LLW that does not meet RCRA Land Disposal Restriction provisions.

Source: NT DOE 1996b.

Table E.2.2–2. Low-Level and Mixed Low-Level Waste Storage and Disposal Facilities at Nevada Test Site

Disposal Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Mixed Waste, P03U Management Unit	Mixed LLW solid	118,908	Interim status. Onsite use only. RCRA Part A 1988. Environmental Assessment published, withdrawn. Considered in Site-Wide EIS.
LLW Disposal, P05U	LLW solid, wood, metal, rubble, debris	66,946	Operational. Additional 616,300 m^3 capacity available for expansion.
LLW Disposal, P06U	LLW solid	27,002	Operational, reserved for future use.
Classified Shallow Land Burial, T02C	LLW solid, metal in approved containers	1,698	Operational, no remaining capacity.
Shallow Land Burial, T03U	LLW solid, metal, debris, unclassified	7,086	Reserved for LLW disposal.
Classified Shallow Land Burial, T04C	LLW solid, metal in approved containers	1,518	Operational.
Mixed Waste Storage Pad	Mixed LLW solid	6,040[b]	Planned. RCRA Part B submitted in 1992.
Bulk LLW Disposal, U3AHAT	LLW solid, wood, metal, soil, biological	424,800	Operational.

[a] Schedules and capacity for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

[b] Estimated assuming no aisle space and containers stacked 2-m high.

Source: NT DOE 1996b; NT REECO 1994a.

Table E.2.2–3. Mixed Low-Level Waste Inventories at Nevada Test Site

Waste Matrix	Number of Waste Streams	Inventory Reported March 1996 (m^3)	5-Year Projection	
			Number of Waste Streams	Total Generation
PCB contaminated soil	1	0.11	0	0
Lead contaminated soil	1	29.8	0	0
Bulk lead waste	4	2.49	0	0
Solvent sludge (Area 12)	1	0.11	0	0
Shipping cask	1	2.2	0	0
Treatability Test Facility solvent	1	0.21	0	0
Analytical Services solvent	1	<0.1	0	0
PICO Fluor	1	0	1	0.3
Cotter Concentrate (A)	1	260	0	0
Cotter Concentrate (B)	1	1.4	0	0
[Text deleted.]				

Source: NT DOE 1996b.
[Text deleted.]

E.2.3 IDAHO NATIONAL ENGINEERING LABORATORY

Activities associated with the development of reactor technology and the extraction of useful nuclear materials at INEL have produced radioactive, mixed, and hazardous wastes that are treated, stored, or disposed of on the site. The Argonne National Laboratory-West (ANL-W) facilities generate and treat TRU, LLW, hazardous, and nonhazardous wastes that are disposed of by INEL per agreement between the DOE Idaho and Chicago Operations Offices. The ROD for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (60 FR 28680), as amended (61 FR 9441), lists decisions dealing with site-wide environmental restoration and waste management programs at INEL.

Pollution Prevention. The DOE Idaho Operations Office has an active Waste Minimization and Pollution Prevention Program to reduce the total amount of waste generated and disposed of at INEL. This is accomplished by eliminating waste through source reduction or material substitution, by recycling potential waste materials that cannot be minimized or eliminated, and by treating all waste that is generated to reduce its volume, toxicity, or mobility prior to storage or disposal. The DOE Idaho Operations Office published its first waste minimization plan in 1990, which defined specific goals, methodology, responsibility, and achievements of programs and organizations. The achievements and progress have since been updated at least annually.

Spent Nuclear Fuel. The inventory of spent nuclear fuel at INEL is cited here in metric tons (t) of heavy metal based on currently available references. There are 109 t (120 tons) of spent nuclear fuel stored at ICPP, 129 t (142 tons) at the Test Area North (TAN), 30 t (32.6 tons) at ANL-W, and 6 t (6.6 tons) at the Naval reactors, test reactors, and power burst facilities. Spent nuclear fuel is stored in facilities designed for a specific fuel type; therefore, storage capacities are not additive for the site. There are 11.6 t (12.8 tons) of graphite reactor fuel, 10.2 t (11.2 tons) of naval reactor fuel, and 252.2 t (278 tons) of commercial and research reactor fuels in the inventory (DOE 1995j:2-7,2-8,3-7). Naval Reactor Facility and Test Reactor Area fuel will be sent to the ICPP for storage. The TAN fuel pool is nearing its design life expectancy. The Three Mile Island core debris stored there will be repackaged and placed in dry storage. Experimental Breeder Reactor-II at ANL-W has its own fuel reconstitution facility to process waste.

The treatment of spent nuclear fuel for long-term storage and disposal is expected to continue at INEL for the next 40 years. Existing rulings designate spent nuclear fuel as a recoverable resource; as such, waste regulations for treatment, storage, and disposal do not apply. There are no plans to dispose of spent nuclear fuel at INEL. Figure E.2.3–1 illustrates spent nuclear fuel management at INEL. As a result of the amended ROD (61 FR 9441) from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203-F), non-aluminum-clad fuels and naval spent fuel will be shipped to INEL for storage. This will increase the spent nuclear fuel to be managed at INEL from 274 t (302 tons) to 381 t (420 tons). INEL will make 114 shipments of aluminum clad spent nuclear fuel to SRS and receive 1,133 shipments of non-aluminum-clad spent nuclear fuel from other DOE sites.

High-Level Waste. HLW has been generated during the reprocessing of spent nuclear fuel at the ICPP. Most of this fuel was from the naval reactors program. The liquid HLW is concentrated by evaporation and converted to metallic oxides by calcination in a fluidized bed. These are then stored in a stable granular solid form. This waste form is stored in stainless steel bins in concrete vaults, where it can be held long enough that the short half-life isotopes have decayed and its activity is reduced. This waste form is a mixed HLW because of the toxic metals it contains.

Liquid HLW in acidic solution is stored in stainless steel tanks. All of this waste will be calcined to allow INEL to meet requirements of a December 9, 1991, Consent Order with the State of Idaho and EPA to cease the use of existing storage tanks without building new tanks. The Department proposes to construct a facility to treat the calcined waste (and any remaining liquid waste) in accordance with RCRA on a schedule to be negotiated

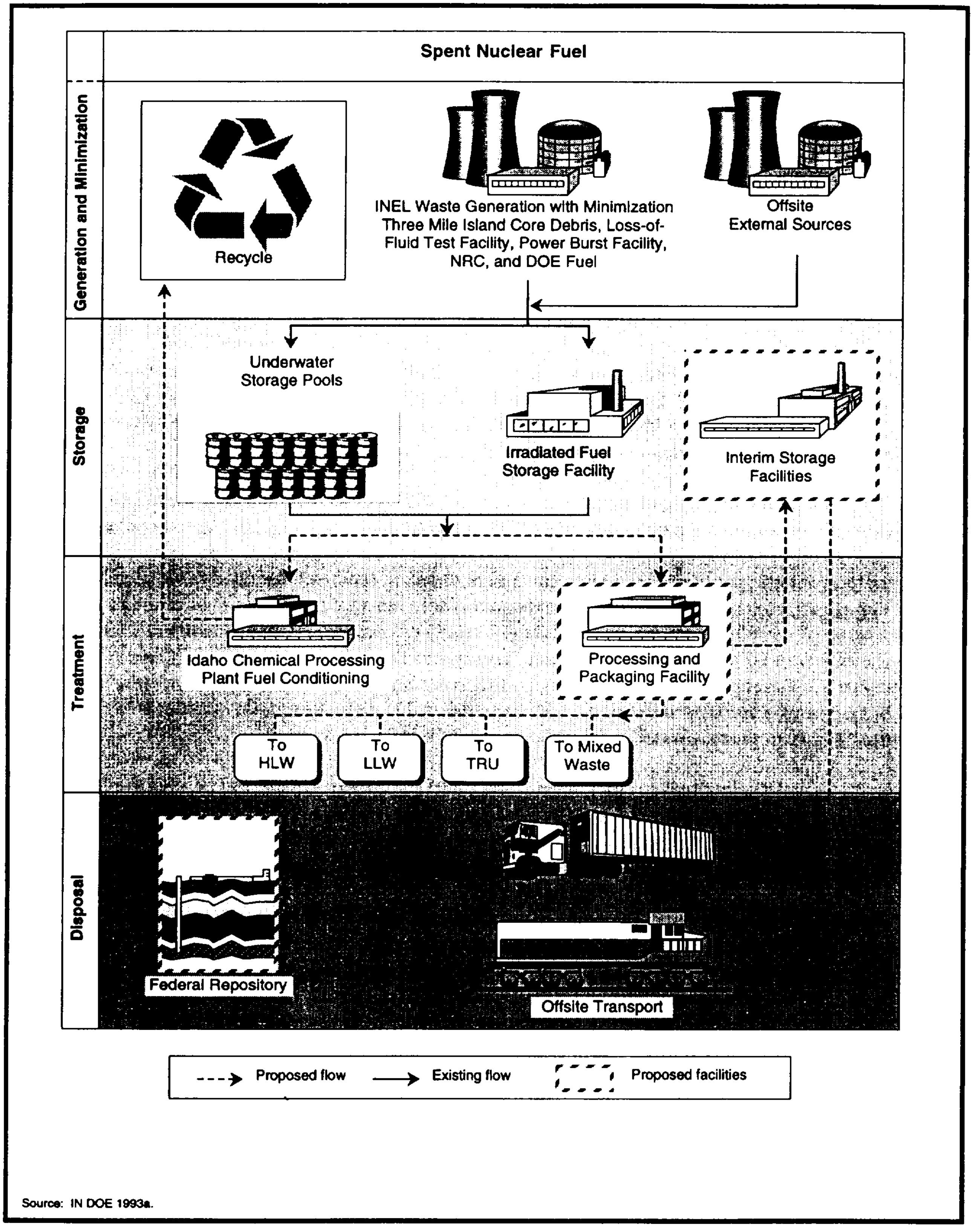


Figure E.2.3–1. Spent Nuclear Fuel Management at Idaho National Engineering Laboratory.

with the State of Idaho under the *Federal Facility Compliance Act*. The Department has selected radionuclide partitioning followed by grouting to immobilize the low-activity waste and vitrification to immobilize the high-activity waste. The HLW inventory, treatment and storage facilities (for example, the High Efficiency Particulate Air [HEPA] Filter Storage Facility) at INEL are listed in Tables E.2.3–1, E.2.3–2, and E.2.3–3. Figure E.2.3–2 illustrates HLW management at INEL.

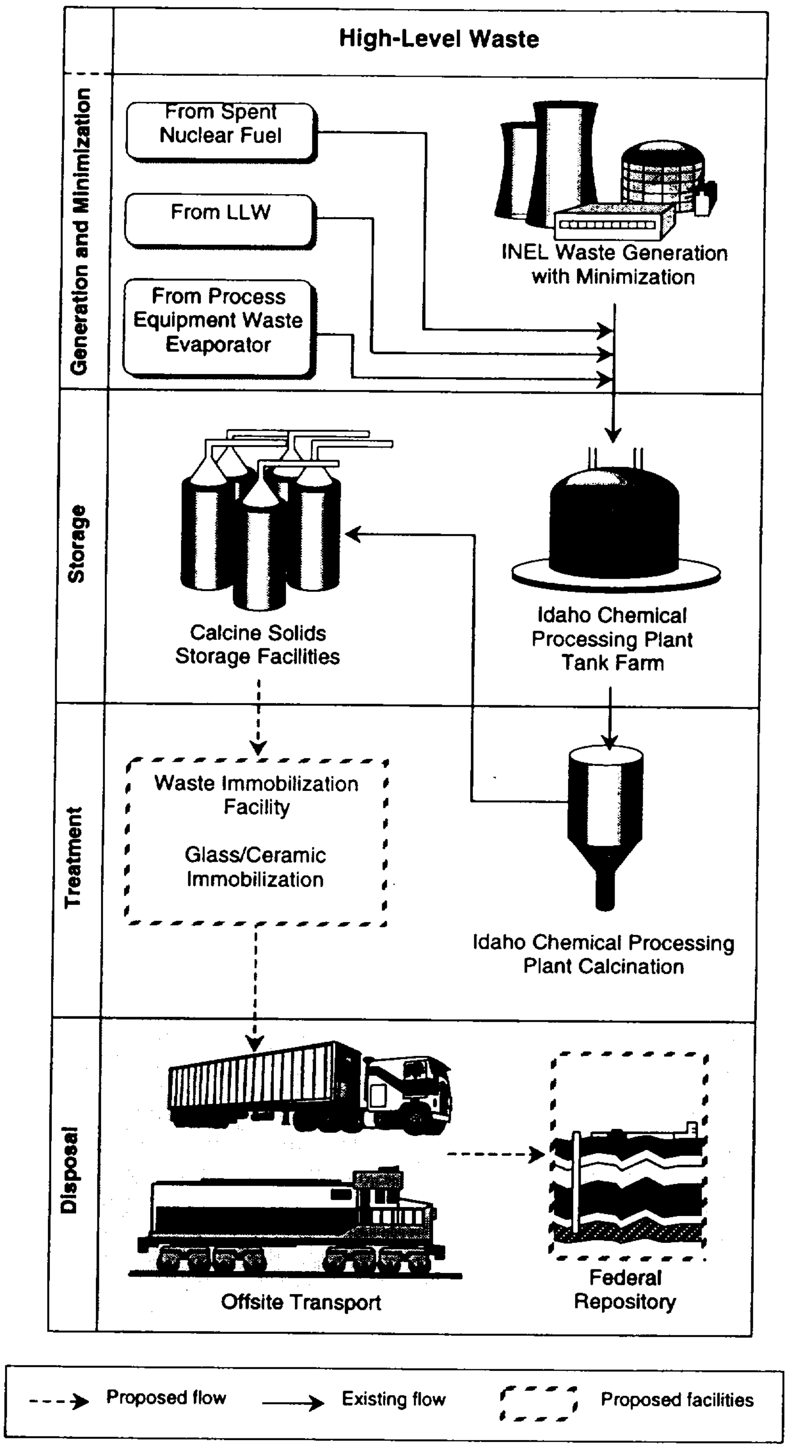
Transuranic Waste. TRU and mixed TRU wastes are stored at the Radioactive Waste Management Complex (RWMC). Prior to 1970, when the Atomic Energy Commission determined that TRU waste required segregation from other wastes, TRU waste was buried in earthen trenches. Since that time, TRU waste has been segregated into contact-handled and remote-handled categories, then packaged and stored for ultimate retrieval and transport to an offsite repository at WIPP. INEL contains 58 percent of DOE's TRU waste. The majority of TRU waste at INEL was shipped from other sites, particularly Rocky Flats Plant (now known as the Rocky Flats Environmental Technology Site [RFETS]), but this practice was stopped in 1989.

The existing treatment facilities for TRU waste at INEL are limited to testing, characterization, and repackaging. The Idaho Waste Characterization Facility, now in the planning phase, will characterize TRU waste and either reclassify it (if it is found to be LLW) for disposal onsite, or prepare it so that it meets the WIPP waste acceptance criteria. The use of commercial treatment facilities is being considered. Modifications of the RWMC to support commercial treatment of alpha-contaminated mixed LLW, the construction of the Advanced Mixed Waste Treatment Project and the Mixed LLW Disposal Facility, and the Plasma Hearth Process Project are being considered subject to funding restraints and additional NEPA review.

The TRU waste at INEL is being stored pending the outcome of the WIPP program. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes will be transported there for disposal. DOE will begin discussions with the State of Idaho regarding treatment options for mixed TRU waste in January 1998, if the Secretary of Energy does not decide to operate WIPP as a disposal facility by that time; or at such earlier time as DOE determines that (1) there will be a delay in the opening of WIPP substantially beyond 1998 or (2) the No-Migration Variance Petition is not granted by the EPA. DOE will propose modification to the INEL Site Treatment Plan for approval by the State of Idaho within a timeframe agreed upon between DOE and the State of Idaho. These modifications will describe planned activities and schedules for the new mixed TRU waste strategy. Figure E.2.3–3 illustrates TRU waste management at INEL. Tables E.2.3–4, E.2.3–5, and E.2.3–6 list the TRU and mixed TRU wastes inventory, and treatment and storage facilities at INEL. Some TRU waste at INEL will never meet WIPP waste acceptance criteria and therefore cannot be sent to WIPP. Other options will have to be developed for these wastes. Approximately one-half of the TRU waste is expected to be reclassified as alpha-contaminated LLW in the future. This waste does not meet INEL waste acceptance criteria for LLW and therefore will be managed as TRU waste. Additionally, INEL may accept TRU waste from other sites for treatment. The treated waste would be returned to the generator or sent to an offsite disposal facility (assumed to be WIPP).

Low-Level Waste. LLW is generated in various forms at INEL facilities. This waste is disposed of at the RWMC. Most of this waste is processed onsite or offsite before disposal by incineration, compaction, or sizing to reduce volume and to stabilize the waste to the maximum extent possible. Some LLW does not meet criteria for onsite disposal. This waste is stored temporarily until treatment and disposal options are developed. Liquid LLW is either evaporated and processed to calcine, or solidified and disposed of. The volume of LLW disposed of at INEL's RWMC is 145,000 m^3 (189,600 yd^3). As of 1991, the facility had an 180,000-m^3 (235,345-yd^3) capacity, with an additional 67,000 m^3 (88,000 yd^3) of expansion capacity available (DOE 1995j:4.14-2). Figure E.2.3–4 illustrates LLW management at INEL.

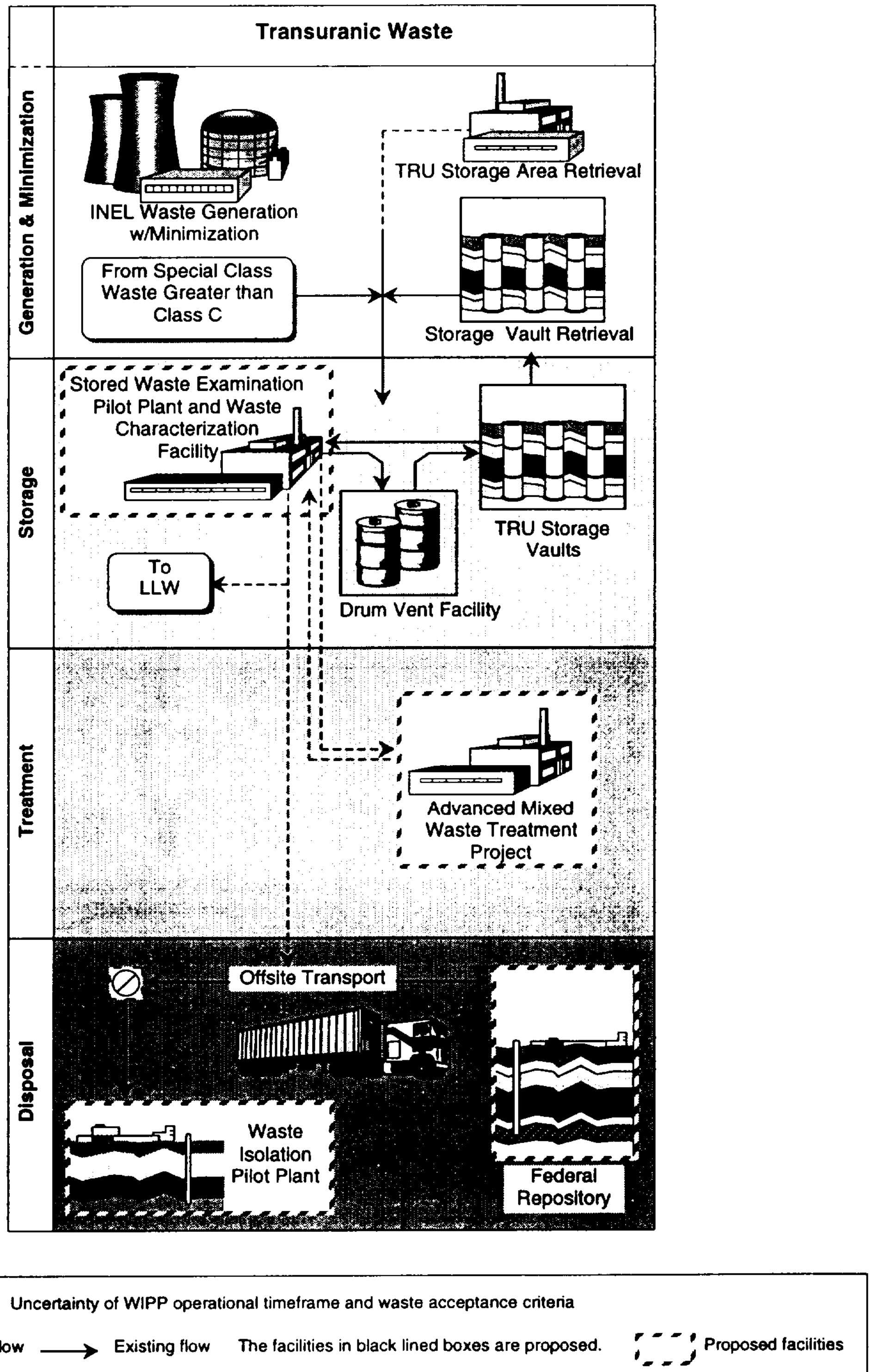
Mixed Low-Level Waste. Mixed LLW is generated in small quantities at INEL and is stored in several areas onsite (ANL-W, ICPP, Special Power Excursion Reactors Test). INEL may also receive limited volumes of mixed LLW from other sites for treatment, with the residuals being returned to the generator. The Waste Experimental Reduction Facility, the Waste Reduction Operations Complex, the ICPP, ANL-W and TAN will



Source: IN DOE 1993a.

2625/FMD

Figure E.2.3–2. High-Level Waste Management at Idaho National Engineering Laboratory.



Source: IN DOE 1993a; IN DOE 1995d.

2626/FMD

Figure E.2.3–3. Transuranic Waste Management at Idaho National Engineering Laboratory.

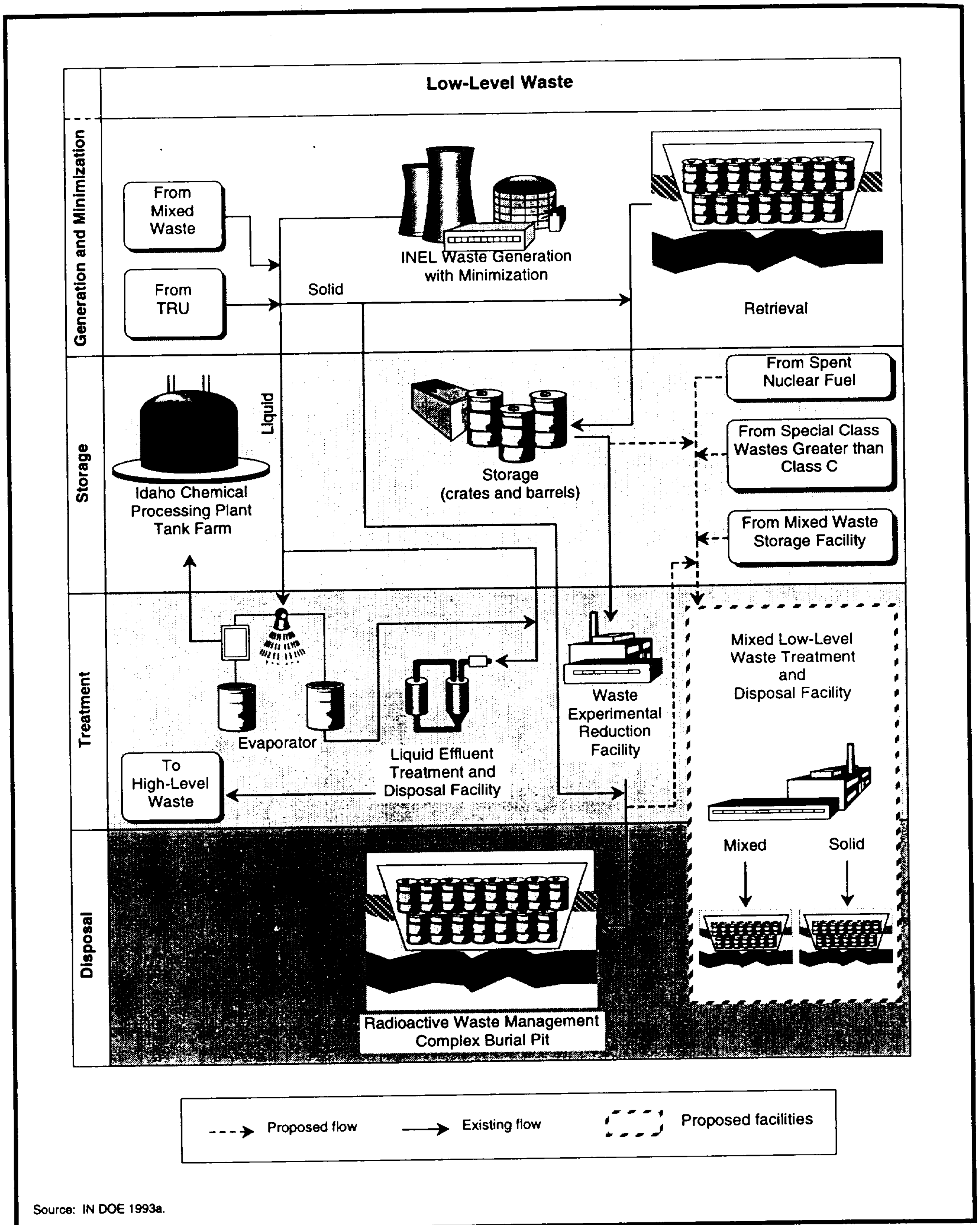


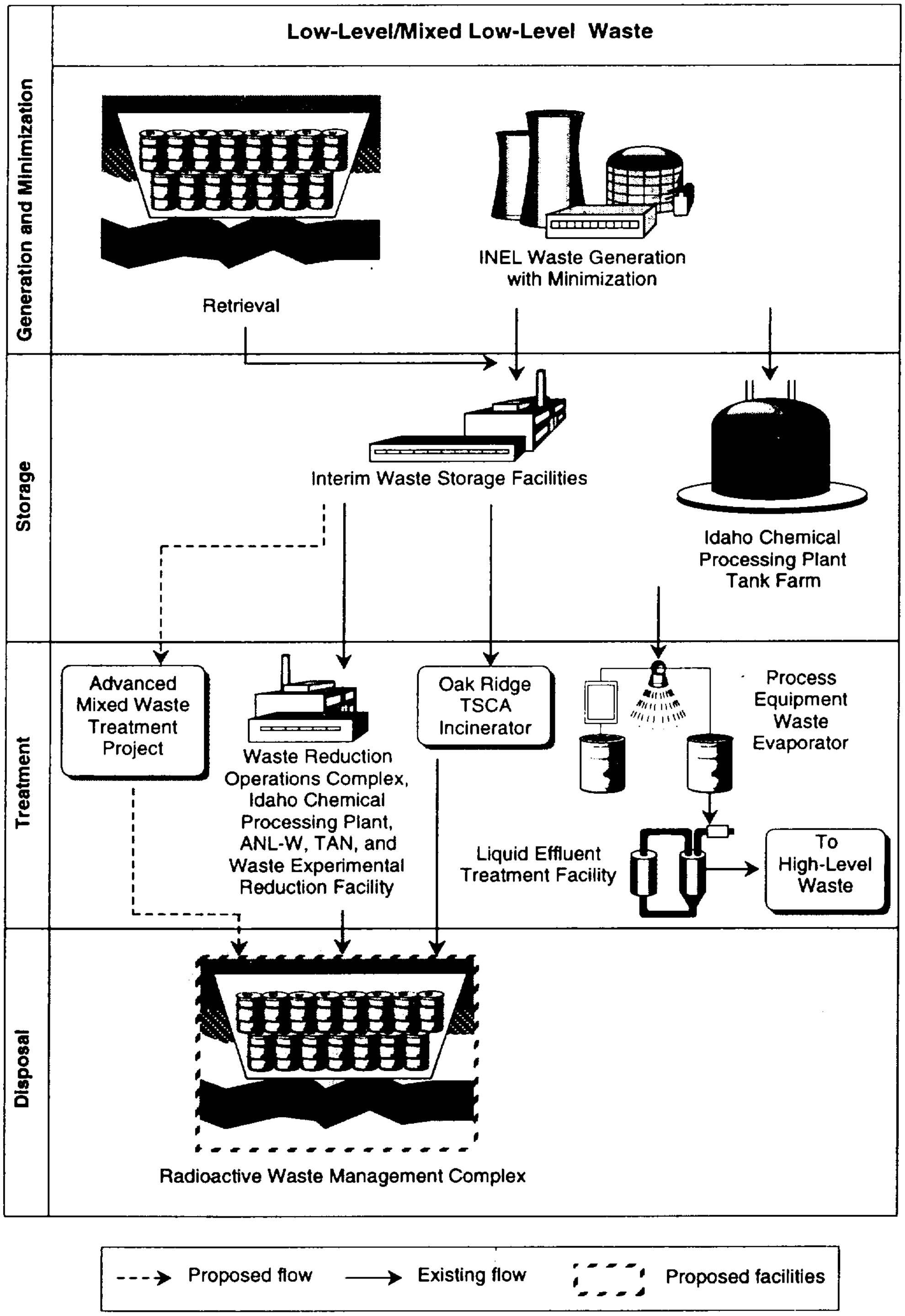
Figure E.2.3–4. Low-Level Waste Management at Idaho National Engineering Laboratory.

process mixed LLW. [Text deleted.] Additional facilities (Advanced Mixed Waste Treatment Project, Mixed/LLW Disposal Facility, and Remote Mixed Waste Treatment Facility) planned for INEL would be able to treat mixed waste and render it acceptable for disposal. Figure E.2.3–5 illustrates mixed waste management at INEL.

Although mixed liquid and solid wastes generated from past operations are stored in many locations at INEL, the bulk of that volume is solid waste stored at the RWMC. Its volume is approximately 66 percent of the TRU waste volume also stored there and is 11 percent of the total volume of waste stored or disposed of at that facility. The inventory of mixed LLW, and treatment and storage facilities at INEL are listed in Tables E.2.3–7, E.2.3–8, and E.2.3–9.

Hazardous Waste. Hazardous waste is staged in a RCRA-permitted building at the Central Facilities Area (CFA) prior to shipment to an offsite commercial RCRA-permitted facility. Table E.2.3–10 lists the hazardous waste quantities shipped offsite in 1994. The INEL waste minimization program is expected to significantly reduce the quantities of hazardous wastes generated at INEL over the next 5 years. By that time, the use of nonhazardous chemicals and the recycle of those for which there is no substitute should nearly eliminate the generation of hazardous waste.

Nonhazardous Waste. Nonhazardous (industrial and sanitary) wastes are processed at each facility on the INEL site and disposed of at the CFA or at the Bonneville County landfill. Wastes are segregated into sanitary, industrial, and asbestos wastes before emplacement. Increased recycling is expected to reduce nonhazardous waste generation by 50 percent by 1997. A new multipurpose facility is planned to be in operation at ANL-W by 1996 to collect, monitor, and consolidate ANL-W nonhazardous wastes before shipment to the CFA. INEL will continue its existing industrial waste program in the future; this will require expansion of the 4.8 ha (12 acres) CFA landfill by 91 ha (225 acres) to provide capacity for the next 30 years (60 FR 28680).



Source: IN DOE 1993a; IN DOE 1995d.

2628/FMD

Figure E.2.3–5. Mixed Waste Management at Idaho National Engineering Laboratory.

Table E.2.3–1. High-Level Waste Inventory at Idaho National Engineering Laboratory

Waste Matrix	Number of Waste Streams	Inventory Reported March 30, 1995 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation Inventory 5-Year Projection (m^3)
Remote-Handled				
Aqueous liquids/slurries	1	7,097	1	2,690
Inorganic process residues (calcined solids)	1	3,741	1	962[a]
Total	2	10,838	2	3,652

[a] Maximum if all calcined directly. Preferred alternative, radionuclide partitioning, will decrease this amount with an increase in LLW to be disposed of.

Source: DOE 1995j; IN DOE 1995d.

Table E.2.3–2. High-Level Waste Treatment Facilities at Idaho National Engineering Laboratory

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
High-efficient particulate air Filter Leach Facility	Chemical extraction	HLW remote-handled-alpha, inorganic debris	Concentrated liquid HLW (to calcine), LLW solid	11.3	Under repair; final RCRA 1990, interim NESHAP 1999
Idaho Chemical Processing Plant Decontamination Facility	Water washing, CO_2 decontamination	HLW remote-handled-debris	HLW remote-handled-solid HLW-remote-handled, LLW liquids	227	Operational 1993
Idaho Waste Immobilization Facility	Vitrification	HLW remote-handled-calcine solids	HLW remote-handled-solid, stabilized	3,020	Unapproved, planned
New Waste Calcining Facility Evaporator	Evaporation	HLW remote-handled-aqueous liquids	HLW remote-handled-aqueous liquids	140,000	Available 2000; interim RCRA 1990
New Waste Calcining Facility	Calcination	HLW remote-handled-aqueous liquid, toxic organic, metals with mercury	HLW remote-handled-solid, (calcine)	44,400[b]	Operational; interim RCRA 1990

[a] For those facilities already in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

[b] Input capacity including high fraction of additives. Unit is rated on output of calcine solids at 470 m^3/yr.

Source: IN DOE 1995d.

Table E.2.3–3. High-Level Waste Storage Facilities at Idaho National Engineering Laboratory

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Idaho Chemical Processing Plant Tank Farm	HLW remote-handled—liquid, corrosive, toxic, listed	13,400	Operational; interim RCRA 1990; to be closed
New Waste Calcine Facility Tanks	HLW remote-handled—liquid, corrosive, toxic, listed	258	Operational; staging tanks for calcined feed; interim RCRA 1990
CPP Calcine Bin Sets	HLW remote-handled—solid, toxic, listed (calcine)	7,114	Operational; State final permit 1992; RCRA Part B submitted 1994. Permit applications for new storage bins (#8 and #9) to be submitted.
Fluorinal and Storage Facility and New Waste Calcine Facility High-Efficiency Particulate Air Filter Storage Facilities	HLW remote-handled—solid, toxic	166	Operational; RCRA Part B submitted 1993

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: DOE 1993b; IN DOE 1995d.

Table E.2.3–4. Transuranic and Mixed Transuranic Waste Inventory at Idaho National Engineering Laboratory

Waste Matrix	Number of Waste Streams	Inventory Reported March 30, 1995 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (yd^3)
Inorganic process residues	53	7,300	0	0
Organic Process Residues	3	57	0	0
Contaminated soils/debris	1	38	0	0
Metal debris	22	8,307	0	0
Combustible debris	17	9,887	0	0
Heterogeneous debris	32	5,210	1	17.7
Unknown/other	7	8,659	0	0
Total	135	39,457	1	17.7

Source: DOE 1995gg.

Table E.2.3–5. Transuranic and Mixed Transuranic Waste Treatment Facilities at Idaho National Engineering Laboratory

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Idaho Chemical Processing Plant	Water washing	HLW, TRU, LLW, mixed LLW, alpha	HLW, TRU, LLW, mixed LLW	114	Operational
	High-efficiency particulate air filter leach	HLW, TRU, LLW, mixed LLW	HLW, TRU, LLW, mixed LLW	11.3	Existing, plan to use
Advanced Mixed Waste Treatment Project	Amalgamate, compaction, decontaminate, incinerate, encapsulate, size, stabilize, desorb, vitrify	TRU, mixed TRU, LLW, mixed LLW, alpha, liquid, and solid	Mixed TRU, LLW	Planned	Unapproved, planned
New Waste Calcining Facility	Calcify	HLW, TRU, LLW, mixed LLW, alpha, liquid	HLW, TRU, LLW, mixed LLW	470	Operational; RCRA interim 1990
Remote Treatment Facility	Melt, drain, evaporate, compact, macroencapsulate, neutralize, incinerate, decontaminate	TRU, LLW, alpha	TRU, LLW	42	Unapproved, planned
Waste Immobilization Facility	Vitrify or stabilize in ceramic	HLW, TRU, LLW, mixed LLW, alpha	HLW, TRU, LLW	3,020	Unapproved, planned

[a] For those facilities already in use, this is a normal operating capacity, whereas for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

[Text deleted.]

Source: IN DOE 1995d.

Table E.2.3–6. Transuranic and Mixed Transuranic Waste Storage Facilities at Idaho National Engineering Laboratory

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
ANL-W Sodium Storage	Mixed TRU solid	19	RCRA Part B submitted 1994
ANL-W Scrap	Mixed TRU solid	193	RCRA Part B submitted 1994
Idaho Chemical Processing Plant High Efficiency Particulate Air Filters	Mixed TRU solid	142	RCRA Part B submitted 1993
Radioactive Waste Management Complex TSA-1, 2, 3	Mixed TRU solid	64,900[b]	Partial closure, RCRA Part B submitted 1994
Radioactive Waste Management Complex Waste Storage	Mixed TRU solid	112,400	RCRA Part B submitted 1991
Radioactive Waste Management Complex Intermediate-Level TRU Storage	Mixed TRU solid	100	RCRA Part B submitted 1991
RE Retrieval Modification Facility	Mixed TRU solid	93,400	RCRA Part B submitted 1994

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.
[b] 108 m^3 usable, 3/30/95.
Note: TSA=TRU Storage Assay
Source: IN DOE 1995d.

Table E.2.3–7. Mixed Low-Level Waste Inventory at Idaho National Engineering Laboratory

Waste Matrix	Number of Waste Streams	Inventory Reported March 30, 1995 (m^3)	Number of Waste Streams, 5-Year Projection	Total Generation, 5-Year Projection (m^3)
Aqueous liquids	11	13	3	14.5
Organic liquids	20	13	6	6.4
Homogenous solids	45	3,934	13	87
Soils/Gravel	10	223	0	0
Debris	81	17,662	15	610
Labpacks	5	4	5	3
Special waste	10	446	13	136
Elemental hazardous materials	8	446	11	136
[Text deleted.]				
Total	190	22,741	66	993

Source: DOE 1995gg.

Table E.2.3–8. Mixed Low-Level Waste and Low-Level Waste Treatment Facilities at Idaho National Engineering Laboratory

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
High Efficiency Particulate Air Filter Leach (CPP-659)	Acid leach	HLW, TRU, mixed LLW-contact-handled, remote-handled, alpha, solid, debris	LLW solid to RWMC, concentrated liquid to tank farm, nonhazardous to sanitary landfill	11	Under modification; RCRA final 1990; interim NESHAP to 1999
ICPP debris treatment and containment	Water wash, carbon dioxide, abrasion	HLW, TRU, mixed LLW-contact-handled, remote-handled alpha, solid, debris	Mixed LLW, HLW, TRU solid, liquid	227	Water wash operational, carbon dioxide existing, plan to use.
Advanced Mixed Waste Treatment Project	Amalgamation, compaction, incineration, macroencapsulation, stabilization, thermal desorption, vitrification	Mixed TRU, mixed LLW, contact-handled, remote-handled alpha	Mixed TRU, mixed LLW, LLW solid	26,900	Unapproved, planned
INEL waste treatment, 40 CFR 262.34	Absorption, neutralization, solidification	Mixed LLW-contact-handled, aqueous liquid, solid, debris	Mixed LLW, LLW	Planned	Operational
Liquid Effluent Treatment and Disposal Facility	Fractionation, evaporation	Mixed LLW-contact-handled, remote-handled liquid (PEW evaporator)	Mixed LLW-contact-handled, remote-handled liquid to acid recycle for New Waste Calcining Facility, or tank farm	12,200	Operational; RCRA final 1990; NESHAP final and State Prevention of Significant Deterioration 1988
Mixed LLW Treatment Facility	Amalgamation, decontamination, incineration, macroencapsulation, neutralization, precipitation, sizing, stabilization	Mixed LLW-contact-handled liquid, solid	Mixed LLW-contact-handled	401	Approved, planned
New Waste Calcining Facility	Calcification	Mixed LLW, HLW, mixed TRU remote-handled liquid	HLW-remote-handled solid	470	Operational; RCRA interim 1990
Portable Water Treatment System	Adsorption, filtration, neutralization	Mixed LLW-contact-handled, aqueous liquid	Mixed LLW	126	Existing, plan to use.

Table E.2.3–8. Mixed Low-Level Waste and Low-Level Waste Treatment Facilities at Idaho National Engineering Laboratory—Continued

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Remote Mixed Waste Treatment Facility	Melt, drain, evaporate	Mixed LLW remote-handled, alpha	Mixed LLW, remote-handled, alpha	42	Unapproved, planned
Sodium Processing Facility	Water reaction	Mixed LLW contact-handled	Mixed LLW contact-handled, decontaminated sodium	698	Existing, needs modification
TAN cask dismantlement	Disassembly, recovery	Mixed LLW contact-handled	Mixed LLW contact-handled	11	Operational
Waste Reduction Operations Complex	Amalgamation	Mixed LLW contact-handled, solid	LLW solid	0.4	Planned, approved
Waste Reduction Operations Complex	Debris sizing	Mixed LLW, LLW contact-handled, solid	Mixed LLW, LLW solid	23	Planned, approved
Waste Reduction Operations Complex	Neutralization	Mixed LLW contact-handled	LLW	4.2	Planned, approved
Waste Experimental Reduction Facility	Incineration, stabilization, macroencapsulation	Mixed LLW contact-handled, liquid, solid	LLW, mixed LLW solid to RWMC (stabilized solids and grout)	Input 49,610; output 236 grout and 2,770 stabilized solids to RWMC	Interim NESHAP 1987, 1992; RCRA interim 1987, 1992; State final 1992. Shut down. Expect operation in 1996.
Waste immobilization	Vitrification or ceramic fusion	HLW, mixed TRU, mixed LLW solid	HLW solid ceramic	3,020	Unapproved, planned

[a] For those facilities already in use, this is a normal operating capacity, whereas for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

[Text deleted.]

Source: IN DOE 1995d.

Table E.2.3–9. Mixed Low-Level Waste and Low-Level Waste Storage Facilities at Idaho National Engineering Laboratory

Storage Unit	Input Capability	Total Capacity [a] (m^3)	Comment
ANL-W radioactive sodium storage	Mixed LLW-TRU	19	RCRA Part B 1994
ANL-W sodium storage	Mixed LLW-TRU	303	RCRA Part B 1994
ANL-W scrap storage	Mixed LLW-TRU	193	RCRA Part B submitted 1994
ANL-W sodium boiler drain tank	Mixed LLW	49	RCRA Part A submitted 1994
Idaho Chemical Processing Plant high-efficiency particulate air filter storage	Mixed LLW	25	RCRA Part B submitted 1993
Idaho Chemical Processing Plant CPP-1619 storage	Mixed LLW	45	RCRA Part B submitted 1995
Idaho Chemical Processing Plant CPP-1617 staging	Mixed LLW	510	RCRA Part B submitted 1995
Idaho Chemical Processing Plant New Waste Calcining Facility high-efficiency particulate air filter storage	Mixed LLW, TRU	141	RCRA Part B submitted 1993
Power Burst Facility Waste Engineering Development Facility storage	Mixed LLW	4	RCRA Part B submitted 1995
Power Burst Facility mixed LLW storage	Mixed LLW	85	RCRA Part B submitted 1993
[Text deleted.]			
Portable storage at SPERT IV	Mixed LLW	237	RCRA Part B submitted 1993
Power Burst Facility Waste Experimental Reduction Facility storage	Mixed LLW	288	RCRA Part B submitted 1993
RWMC TRU modules	Mixed LLW, alpha LLW, TRU	112,400	RCRA Part B submitted 1990, interim TSCA 1992
RWMC intermediate-level storage	Mixed LLW, alpha LLW, TRU	100	RCRA Part B submitted 1991
[Text deleted.]			
Test Area North 647 waste storage	Mixed LLW	104	RCRA Part B submitted 1996
Test Area North 628 SMC container storage	Mixed LLW	125	RCRA Part B submitted 1993

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: IN DOE 1995d.

Table E.2.3–10. Hazardous Waste Quantities Shipped Offsite in 1994 at Idaho National Engineering Laboratory

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume (m^3)[a]
Butanols	1	210	0.1
Caustic alkali liquids, n.o.s.	3	395	0.4
Combustible liquid, n.o.s.	5	409	0.4
Compounds, cleaning liquid	2	196	0.2
Corrosive liquids, n.o.s.	12	2,683	0.3
Corrosive liquids, poisonous, n.o.s.	1	13	<0.1
Corrosive solid, n.o.s.	12	3,683	2.5
Environmentally hazardous substances, solid, n.o.s.	5	64,794	43.2
Flammable liquids, corrosive, n.o.s.	6	206	0.2
Flammable liquids, n.o.s.	20	5,750	5.7
Flammable liquids, poisonous, corrosive, n.o.s.	3	387	0.4
Flammable solids, n.o.s.	1	6	<0.1
Flammable solids, poisonous,n.o.s.	1	6	<0.1
Hazardous waste, liquid, n.o.s.	22	10,735	10.7
Hazardous waste, soil, n.o.s.	29	11,730	7.8
Insecticide gases, n.o.s.	1	5	<0.1
Metal powders, flammable, n.o.s.	1	27	<0.1
Organic peroxide, type D, liquid	1	3	<0.1
Oxidizing substances, liquid, corrosive, n.o.s	1	8	<0.1
Oxidizing substances, solid, poisonous, n.o.s	1	5	<0.1
Oxidizing substances, solid, corrosive, n.o.s	1	322	0.2
Oxidizing substances, solid, n.o.s	6	411	0.3
Poisonous liquids, corrosive, n.o.s.	1	5	<0.1
Poisonous liquids, flammable, n.o.s.	1	32	<0.1
Poisonous liquids, n.o.s.	5	364	0.4
Poisonous solid, n.o.s.	8	240	0.2
Polychlorinated biphenyls	6	3,184	2.1
Substances which in contact with water emit flammable gases, solid	1	5	<0.1

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 500 kg/m^3 for gases, 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solids.

Note: n.o.s.=not otherwise specified.

Source: DOE 1995h.

E.2.4 PANTEX PLANT

This section describes the baseline conditions and specific waste management operations at Pantex. As part of its normal operations, Pantex generates low-level, mixed low-level, hazardous, and nonhazardous wastes. Tables E.2.4–1 and E.2.4–2 present a detailed description of treatment and storage facilities with estimated capacities.

Pantex's goals regarding the management of LLW, mixed LLW, and hazardous wastes are as follows:

- Minimize the volumes of low-level radioactive, mixed low-level, and hazardous wastes generated to the extent technologically and economically practicable
- Recycle those wastes applicable to the best available technology
- Minimize contamination of existing or proposed real property and facilities
- Ensure safe and efficient long-term management of all wastes

Pollution Prevention. Pantex has a waste minimization program that was created to define an effective waste minimization system for the site. A committee provides awareness of the program, identifies tasks, and provides liaison between the site and outside entities. Some of the accomplishments of this program are as follows:

- Compactor used to compact 1,200 drums to approximately 250 drums. Disposal cost savings of approximately $300,000 was achieved.
- Separation of radioactive and hazardous waste materials when shearing weapons components. Reclamation of gold from this process netted $243,000 in the first year.
- Reclamation of oil, antifreeze, and refrigerant.
- Substitution of scintillation solution that is nonhazardous.
- Reuse of explosives and solvents.
- Repackaging of paint into smaller containers.
- Substitution of naphtha with nonhazardous biodegradable cleaning solution.

Transuranic Waste. No TRU waste or mixed TRU waste is currently generated at Pantex during normal operation. However, there is a potential for an off-normal event to generate small amounts of contact-handled TRU waste or mixed TRU waste during a weapon-dismantlement activity. Three drums of TRU waste were generated several years ago from an incident during weapon dismantlement. Ultimately, Pantex plans to ship its TRU waste to a DOE-approved storage site when available. In the interim, approximately 1 m^3 (1.3 yd^3) of TRU waste is temporarily stored in Building 12-42 (DOE 1995gg).

Low-Level Waste. The following options are available for the management of LLW streams:

- Continue to ship to an approved DOE disposal site such as NTS
- Compact solid waste, if possible

- Continue improvements to computerized tracking of radioactive waste

- Implement improved segregation program

Solid LLW generated at Pantex consists of contaminated parts from weapons assembly and disassembly functions and waste materials associated with these functions, such as protective clothing, cleaning materials, filters, and other similar materials. The compactible components of this waste are processed at the Pantex Solid Waste Compaction Facility and staged along with the noncompactible components for shipment to a DOE-approved disposal site. Table E.2.4–3 lists Pantex's LLW streams, how they are generated, primary radioactive constituents, and method of storage or disposal. Table E.2.4–4 presents the inventory of LLW at Pantex as of December 2, 1994, as well as a 5-year projection.

Mixed Low-Level Waste. The following options are available for the management of mixed LLW streams:

- Store onsite pending treatment to satisfy LDR requirements. This is the current option now being used at Pantex (PX DOE 1996b:4-193).

- Treat to satisfy LDR requirements and ship to an approved commercial facility or other DOE-approved facility for storage or disposal.

- Ship off site for treatment and disposal.

Pantex manages its mixed waste in accordance with the *Pantex Plant Federal Facility Compliance Act Compliance Plan.* Pantex generates solid mixed LLW during weapons component testing functions. These wastes consist primarily of depleted uranium and beryllium residue and fragments from explosive components tests, contaminated soils, cleaning materials, and protective clothing associated with these operations. Other mixed LLW streams include cleaning materials from weapons assembly and disassembly operations. Mixed LLW (high explosives [HE] contaminants only) is currently treated at the Burning Ground, which has a permitted capacity of 180 m^3/yr (236 yd^3/yr) (DOE 1995gg). The Hazardous Waste Treatment and Processing Facility is being planned to treat mixed waste in mobile treatment units. Table E.2.4–5 lists Pantex's primary mixed waste streams, composition, method of process, and treatment alternatives. Table E.2.4–6 lists organic liquid mixed LLW stream candidates that are being evaluated for commercial treatment and/or disposal. Table E.2.4–7 lists the mixed waste storage inventory as of September 1995, as well as a 5-year projection.

Hazardous Waste. The following options are available for the management of hazardous waste streams:

- Continue to ship to approved hazardous waste disposal facilities

- Encapsulate solid waste and ship to a DOE-approved disposal site

- Treat onsite for neutralization of corrosive wastes

Table E.2.4–8 presents the inventory for hazardous waste at Pantex as of December 2, 1994, as well as a 5-year projection. The treatment of hazardous waste is done at the following facilities:

- The Burning Ground is an open-burning area where explosives, explosive-contaminated waste, and explosive-contaminated spent solvents are burned. A large volume reduction is attained by this treatment, and some wastes are rendered nonhazardous due to elimination of the HE reactivity hazard.

- The Hazardous Waste Treatment and Processing Facility will house liquid-phase and solid-phase hazardous, low-level, and mixed waste processing activities. The facility has been planned and approved and should be available in 2000.

Not all of the hazardous waste is treated at Pantex. The amount of hazardous waste shipped offsite in 1994 is shown in Table E.2.4–9. There are several separate storage facilities for hazardous wastes.

- In the Hazardous Waste Drum Storage Area, all liquid drums are placed in spill-containment pans. The facility is inspected weekly for leakers. Small lab samples of hazardous waste are stored in two chemical storage containers in this area. The materials stored in the area include asbestos, mercury-contaminated wastes, Burning Ground ash, and electroplating sludge.

- At Building 16-1, used crank case oil is stored underground until sufficient quantities are generated for offsite processing.

Class 1 non-RCRA-hazardous waste includes asbestos-contaminated materials, PCBs with a concentration greater than 50 parts per million (ppm), and oils with a total petroleum hydrocarbon concentration greater than 1,500 ppm. Table E.2.4–10 presents the Class 1 non-RCRA hazardous waste streams, current inventories as of December 2, 1994, and projected generation volumes.

Medical waste is defined as any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals; in research; or in the production or testing of biologicals. This waste includes cultures and stocks, pathological wastes, human blood and blood products, sharps, animal waste, and isolation wastes. Pantex currently generates approximately two boxes per week, each with a capacity of 0.142 m^3 (0.186 yd^3). The annual generation rate of medical waste at Pantex is approximately 15 m^3 (19 yd^3) (PX DOE 1995i:14–15). Medical waste is dispositioned through a commercial vendor who picks up and transports the medical facility's biomedical and infectious waste.

Nonhazardous Waste. The Sewage Treatment Quality Upgrade is a 1996 project at Pantex. This project would upgrade the Pantex sanitary system to ensure that wastewater standards are met through secondary/tertiary treatment. Included in this project is the upgrade of the existing sewage treatment lagoon, repair and replacement of existing deteriorated sewer lines, construction of a closed system to eliminate the use of open ditches for conveyance of industrial wastewater discharges, and implementation of a plant stormwater management system.

Class 2 nonhazardous waste (general refuse) is collected at each building from trash cans and placed in dumpsters. This includes cardboard, computer paper, white paper, colored paper, mixed steel, steel and aluminum cans, mixed metal, mixed plastic, foam rubber, and glass. Currently, telephone directories, paper, certain plastics, and some steel and aluminum cans are being recycled. The weights of Class 2 nonhazardous waste disposed from 1989 to 1994, and the estimated amounts for 1995 through 1999, are given in Table E.2.4–11.

Table E.2.4–1. Waste Treatment Facilities and Capabilities at Pantex Plant

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Batch Master Hazardous Waste Tank System (Building 12-68)	Filtration, neutralization, and precipitation	Building 12-5C metal cleaning bath, plating process waste, sodium hydroxide radiator cleaner, and spent electrolyte solutions	Metal precipitates to Hazardous Waste Storage Pad and effluent to Wastewater Treatment Plant	Process as needed	Nonoperational due to pending closure
Building 11-15A	Immobilization	Mixed LLW	To be determined	185	Planned
Building 11-9	Immobilization	Mixed LLW	To be determined	185	Planned
Building 11-9S	Stabilization and macroencapsulation	Mixed LLW and hazardous waste	Sent to Hazardous Waste Treatment and Processing Facility when completed.	2 m^3/treatment	Also used as 90-day accumulation area for hazardous and mixed LLW. Maximum inventory of waste for facility is 6 m^3.
Building 11-50 (Wastewater Treatment Facility)	Filtration of organics and undissolved HE particles	HE machining operations	Playa 2	684	
Building 12-43 (HE Filtration Facility)	Filtration of HE and carbon	Explosive machining operations in Building 12-24	Playa 1	180	Sock filter and carbon filter
Building 12-73	Settlement and filtration	HE-contaminated water	Sanitary sewage system	Variable	Settling tank and fabric filter system
Burning ground: one cage, one tray, and one pan	Open burning or detonation	Solid mixed LLW and hazardous waste	Ash to 11-7N Storage Pad	909	Design capacity until 2001. Interim
Closed-loop decontamination system	Reduction	Contaminated lead (solid mixed LLW)	Acid bath (liquid mixed LLW), pH adjusted, and then solidified	Campaign	One process per year. Standby mode.
Compactor (Building 12-42)	Hydraulic ram compactor-in-drum compaction	Solid LLW (gloves, kimwipes, paper)	Compacted LLW in 17H 55-gal drums to storage magazine 4-56	Process as needed	No TRU waste, waste greater than Class C, mixed waste, free liquids, or gases
Hazardous Waste Treatment and Processing Facility	Immobilization repackaging, neutralization compaction, shredding, sorting, and solidification	Liquid and solid LLW, mixed LLW and hazardous waste	To be determined, may be stabilized solids	500	Available for treating mixed waste by 2000

Table E.2.4–1. Waste Treatment Facilities and Capabilities at Pantex Plant—Continued

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Mobile Macroencapsulation	Immobilization	Solid mixed LLW	Macroencapsulated forms	125	Design capacity. Planned portable system.
Mobile Stabilization Treatment Process (Skid)	Precipitation and solidification	LLW	Immobilized forms	60	Mobile treatment planned
Sanitary Sewage Treatment System	Aeration and anaerobic microbial action	Sanitary sewage and industrial waste	Lagoon (chlorine treatment before release	2,460,000 l/day	Permitted flow. Operational flow about 1,610,000 l/day

[a] For those facilities already in use, this is a normal operating capacity; whereas, for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability funds and permit issuance.

Source: DOE 1993h; DOE 1994n; DOE 1995gg; PX DOE 1995i; PX DOE 1996b.

Table E.2.4–2. Waste Storage Facilities at Pantex Plant

Storage Unit	Input Capability	Total Capacity (m^3)[a]	Comment
Buildings 4-46, 4-72 and 4-74	Liquid and solid mixed LLW	187	Permitted capacity. Operating capacity is 120 m^3.
Buildings 11-7A and 11-7B	Liquid and solid mixed LLW	402	Permitted and operating storage capacity
Building 11-7N Pad	Liquid/solid hazardous waste, mixed LLW, and LLW	125	Interim Permit dated February 16, 1996. Permitted and operating capacity.
Building . 11-9N	Various liquid and solid hazardous wastes	379	Permit dated February 16, 1996. Permitted capacity. Operating capacity is 252 m^3.
Conex containers WM-1 to WM-8	Containerized solid mixed LLW and silver photo wastes	575	Permit dated February 16, 1996. Permitted capacity. Operating capacity is 120 m^3.
Conex containers WM-1A, WM-1B, WM-3A, WM-5A, WM-5B	Containerized liquid and solid LLW	377	Permitted capacity. Operating capacity is 75 m^3.
Conex containers (25)	Solid LLW	1,800	Each conex can store 72 55-gal drums (15 m^3) for an operating capacity of 375 m^3.
Magazine 4-50	Liquid/solid mixed LLW, hazardous waste and LLW	421	Permit dated February 16, 1996. Permitted capacity. Operating capacity is 40 m^3.
Magazine 4-56	Liquid and solid LLW	421	Temporary storage before shipping to NTS. Operating capacity is 40 m^3.
RCRA Hazardous Staging Facility (Building 16-16)	Containerized liquid/solid LLW and mixed LLW	1,050	Permitted capacity. Operating capacity is 333 m^3. Currently under construction.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: DOE 1994n; PX DOE 1995i; PX DOE 1996b.

Table E.2.4–3. Low-Level Waste Streams at Pantex Plant

Sources	Waste Description	Radioactive Constituents	Primary Materials	Disposition
Assembly/ dismantlement operations	Debris from demilitarization and sanitization operations	Thorium, U–238, tritium	Generally noncompactible crushed/ granulated plastic and metal debris	Disposed of at DOE-approved offsite facility
Assembly/ dismantlement/ stockpile surveillance	Compactible material from normal assembly/dismantlement/stockpile surveillance	U–238, tritium, thorium, and plutonium	Lab wipes and other support materials	Disposed of at DOE-approved offsite facility
Assembly/ dismantlement and stockpile surveillance operations	Radiological materials from normal operations associated with weapons assembly, dismantlement, facility surveillance, container monitoring and routine sample counting operations	U–238, tritium, thorium, and plutonium	Protective clothing, wipes, swipes, tape, plastic and other material in the radiation protection program	Disposed of at DOE-approved offsite facility
Weapon component testing and evaluation	Debris generated during past testing of mock devices associated with any known waste stream	Depleted U–238 residue	Contaminated soil and gravel, additional miscellaneous materials	Stored onsite pending eventual shipment to DOE-approved disposal site
Decontamination products	Materials generated during the decontamination of a concrete assembly work cell (one-time generation).	Tritium	Protective clothing, concrete rubble, solidified liquids, tools, equipment, plastic and paper products containing tritium	Stored onsite pending eventual shipment to DOE-approved disposal site

Note: U=uranium.

Source: PX DOE 1995i.

Table E.2.4–4. Low-Level Waste Inventory at Pantex Plant

Waste Stream Name	Inventory as of December 2, 1994 (m^3)	Total Generation, Five-Year Projection (m^3)
Beryllium waste, radioactive	114[a]	0
Tritium contaminated waste (solid/liquid)	55	179
Lab packs, nonregulated radioactive (solid)	1	1
Contaminated soil, radioactive	8	0
Waste water	7	9
Contaminated metal, radioactive	2	0.02
Desiccant, radioactive	0.2	22
Plant refuse (paper, foam, rags, cardboard), radioactive	105	711
Miscellaneous ash, radioactive	9	0
Total	301	922

[a] One-time event; no further generation is expected.
Source: PX DOE 1995i.

Table E.2.4–5. Mixed Low-Level Waste Streams at Pantex Plant

Treatability Group	Waste Stream Name	Composition[a]	Process Description	Treatment Alternatives
Organic liquids	Paint waste—organic liquids	Paint and solvent	Stripping, surface preparation, and repainting	Planning packed bed reactor (Mobile Treatment Unit)
	Spent solvents	Freon, methyl ethyl ketone, HE, and dimethyl sulfoxide	Cleaning dissolution of HE	Planning hydrothermal oxidation (Mobile Treatment Unit) or offsite by commercial vendor
	Contaminated oils	Mercury-contaminated oil	Vacuum pump oil change	Planning packed bed reactor/silent discharge plasma (Mobile Treatment Unit)
Aqueous liquids	Wastewater	Water, HE, chromium, lead	Water-jet and thermal shock activities	Planning evaporative oxidation and stabilization (Mobile Treatment Unit)
	Alodine solution	Chromic acid, fluoride salt, and iron cyanide	Surface preparation before paint removal	Planning plating waste treatment (Mobile Treatment Unit)
	Metal cleaning waste	Water, iodine, nitric acid, uranium, thorium, cadmium, chromium, lead, and mercury	Etching and cleaning of metals	Planning plating waste treatment (Mobile Treatment Unit)
Homogenous solids	Wastewater sludge from explosives	Explosive contaminated solids, dimethyl sulfoxide	Filtering of wastewater with HE	Open-air burning
	Process residues	Residues resulting from treatment of mixed waste	Waste not generated until onsite mixed waste treatment commences in 2000	Planning stabilization by Mobile Treatment Unit
	Burning Ground ash	Inorganic ash residue, metals, and some unburned organic material	Burning of HE and HE-contaminated materials	Planning stabilization/barium sulfate (Mobile Treatment Unit)
Soils/gravels	Environmental Restoration potential mixed waste (soils)	Contaminated soils from solid waste management units, spill cleanup, drill cuttings, sample wastes, etc.	Environmental Restoration program site contaminated soils	Planning thermal desorbtion and stabilization
Debris waste	Solvent-contaminated solid material	Alcohol, kimwipes, filters, rags, leads, solvents	Weapon dismantlement and maintenance	Planning macroencapsulation
	Contaminated scrap metal	Contaminated scrap metal from demilitarized and sanitized weapons parts	Demilitarization and sanitation activities	Planning macroencapsulation
	Lead-contaminated waste	Seals and tape intermixed with gloves and paper	Demilitarization and sanitation activities	Planning macroencapsulation
	Mercury-contaminated solids	Glass bulbs, mercury-contaminated solids	Maintenance of lighting	Planning macroencapsulation

Table E.2.4–5. Mixed Low-Level Waste Streams at Pantex Plant—Continued

Treatability Group	Waste Stream Name	Composition[a]	Process Description	Treatment Alternatives
	Heterogeneous debris-metal contaminated waste	Metals, alodine, light ballasts, beryllium	Maintenance and special activities	Planning macroencapsulation
	Heterogenous debris	Solid wipes, gloves, and anti-C suits	Painting, paint removal, maintenance testing and disarmament activities	Planning macroencapsulation
	Plutonium contaminated solids	Personnel protection equipment, epoxy, floor sweepings, paint, and paint thinners	Dismantlement operations in Building 12-98	Planning macroencapsulation
	Contaminated support material and contaminated explosives	Support materials with HE residue, mercury, and solvents	Assembly/disassembly process	Planning macroencapsulation
Lab Packs	Lab Packs	Epoxy, uranium, acid, lead, thorium nitrate crystals	Disposal of chemicals from testing labs	Proposed radioactive surveying followed by preparation and onsite treatment is unable to reclassify hazardous wastes
	Miscellaneous organic liquids	Halogenated and nonhalogenated solvents	Paint, solvent, and special product material storage	Planning hydrothermal oxidation (Mobile Treatment Unit)
	Scintillation fluids	Scintillation fluids packaged with vermiculite	Radioactivity testing	Commercial treatment. Fluids need to be bulked first.
Special wastes	Used batteries	Nickel, cadmium, lead, silver, mercury, and asbestos	Dismantlement activities	Decontamination and downgrade to hazardous waste
	Lead waste	Portion of lead drum liners	Removal of lead liner from drum	Proposed treatment utilizing decontamination, macroencapsulation (Mobile Treatment Unit)
	Aerosol containers	Discarded spray paint cans	General maintenance	Decontamination

[a] Typical radionuclides that may be present in the mixed waste include uranium, thorium, and tritium.

Source: DOE 1994k; DOE 1995gg.

Table E.2.4–6. Organic Liquid Waste Streams Candidates for Commercial Treatment and/or Disposal

Waste Stream	Quantities of Waste (l)	Treatable Volume (l)	Composition[a]	Process Description
Lab packs[b]	4,030	988	Scintillation vials packed in cardboard boxes in vermiculite	Laboratory waste packages
Organic debris; solvent-contaminated	163	163	Joint test assembly cleanup water, oil, water	Support material
Spent solvent	3,920	1,740	Scintillation vials packed in cardboard boxes in vermiculite; joint test assembly cleanup water; freon with HE	Spent solvents
Mercury-contaminated liquids	492	492	Oil contaminated with mercury	Discarded oil from vacuum pumps in laboratory equipment; source of mercury contamination from samples analyzed in lab equipment
Total	8,605	3,383		

[a] Mixed LLW stream may include uranium, thorium, tritium, and Pu.

[b] Cardboard boxes and vermiculite used to packed scintillation vials will be recontainerized and treated as separate sampling lots.

Source: PX DOE 1995i.

Table E.2.4–7. Mixed Low-Level Waste Inventory at Pantex Plant

Treatability Group	Number of Waste Streams	Inventory as of September 1995 (m^3)	Total Generation, 5-Year Projection (m^3)
Aqueous liquids	4	2	24
Organic liquids	5	7	2
[Text deleted.]			
Inorganic solids	2	19	8
Compressed gases	1	0.004	None
Soils	1	None	190
Batteries	1	0.05	1
Debris waste	7	84	634
Liquid mercury	1	0.001	None
Lab Packs	1	2	2
Explosives	2	13	58
Total	25	127	919

Source: PX DOE 1995h.

Table E.2.4–8. Hazardous Waste Inventory at Pantex Plant

Waste Stream Name	Inventory as of December 2, 1994 (m^3)	Total Generation, Five-Year Projection (m^3)
Explosive-contaminated solid waste	4	23
Burning ground waste from thermal treatment	1	7
Lab packs (solid)	0.4	6
Photographic film	0	0.7
Lead waste	0	0.08
Spent halogenated and non-halogenated solvents and mixtures	0.7	34
Heavy metal contaminated parts	0	0.8
Contaminated soil[a]	0	14,800
Sodium hydroxide waste (solid)	0	8
Paint sludge	2	3
Wastewater from operations and monitoring[a]	0.4	34
Metal cleaner and photographic waste	0.05	13
Recyclable and non-recyclable used batteries	0.4	197
Solvent-contaminated solids	3	29
Mercury (solid/liquid)	0	0.01
Sandblasting waste	0.6	1
Lead-contaminated waste	0	0.7
Miscellaneous organics (solid/liquid)	0.4	15
Contaminated engine oil	0.1	2
Oil filter waste	0.02	0.5
Miscellaneous discards contaminated with heavy metals	23	356
Empty organic compressed gas cylinders	0.3	24
Recyclable scrap metal with precious metals	0.2	1
Total	36	15,556[b]

[a] These streams are primarily associated with Environmental Restoration activities.

[b] Of this total, approximately 550 m^3 is directly from weapon activities (components plus support materials), and the balance is from other plant activities.

Source: PX DOE 1995i.

Table E.2.4–9. Hazardous Quantities Shipped Offsite in 1994 at Pantex Plant

Description	Number of Shipments Containing Description	Quantity (kg)	Estimated Volume[a] (m^3)
Hazardous waste, solid, n.o.s.	9	14,200	9
Corrosive liquids, n.o.s.	2	538	0.5
Flammable liquids, n.o.s.	1	202	0.2
Hazardous waste, liquid, n.o.s.	2	149	0.2
Oxidizing substances, solid, corrosive, n.o.s.	1	166	0.1
Oxidizing substances, solid, poisonous, n.o.s.	1	6	<0.1
Poisonous liquids, n.o.s.	1	28	<0.1

[a] For those shipments in which only a mass quantity was provided, a volume estimate was made based on density factors of 1,000 kg/m^3 for liquids and 1,500 kg/m^3 for solids.

Note: n.o.s.=not otherwise specified.

Source: DOE 1995h.

*Table E.2.4–10. Class 1 Non-*Resource Conservation and Recovery Act *Hazardous Waste Inventory at Pantex Plant*

Waste Stream	Inventory as of December 2, 1994 (m^3)	Total Generation, 5-Year Projection (m^3)
Beryllium waste	0	740
Empty containers	142	985
PCB-contaminated solids	0.05	0.05
Crank case oil	1	260
Asbestos solids	13	24
PCB-contaminated oil	0	0.06
Paint residue	3	53
Contaminated soil[a]	5	2,354
Metal cleaning waste (solid)	0	0.3
Wastewater[a]	24	1,601
Recyclable and nonrecyclable photographic waste	0.02	0.3
Contaminated metal	0.1	0.7
Antifreeze and engine coolants	0.3	337
Desiccant	0	4
Plant refuse, such as paper, foam, rags, and cardboard	51	543
Used oil filters generated during maintenance	3	23
Miscellaneous ash	4	5
Resins, tar, or tarry sludge (excess material from laboratories)	3	36
Total	249	6,966

[a] These waste streams are primarily associated with Environmental Restoration activities.

Source: PX DOE 1995i.

Table E.2.4–11. Class 2 Nonhazardous Waste Disposal in Amarillo Landfill From Pantex Plant

Year	Total Disposal (kg)	Total Volume of Disposal (m^3)
1989[a]	79,600	53
1990	335,000	223
1991	307,000	205
1992	371,000	247
1993[b]	428,000	285
1994	589,000	393
1995-1999 (estimate)[c]	2,610,000	1,740

[a] Contract for disposal began in 1989 and included only approximately 3 months.
[b] Recycling was stopped midyear because of low cost-effectiveness.
[Text deleted.]
[c] Waste minimization efforts are expected to provide an average reduction of 4 percent each year.
Source: PX DOE 1995i.

E.2.5 Oak Ridge Reservation

The Oak Ridge Reservation consists of three operating industrial complexes in and around the City of Oak Ridge. The Energy Systems Waste Management Organization provides the waste management oversight for ORR. It also provides guidance to each of the operating facility waste management divisions that are responsible for operating and managing their respective waste management facilities and activities.

Y–12 Plant

Laboratory, maintenance, construction, demolition, and cleanup activities; machining operations; and waste produced in the purification of uranium for recycle are the primary waste generation activities at the Y–12 Plant (Y–12). In addition, metal-plating operations generate plating waste solutions, while various laboratory activities generate reactive wastes and waste laboratory chemicals. Liquid process waste and the sludge resulting from their treatment are generated throughout the plant. Waste oils and solvents are generated from machining and cleaning operations. Daily operations, such as janitorial services and floor sweepings, generate both noncontaminated and uranium-contaminated industrial trash.

Pollution Prevention. The Y–12 Pollution Prevention Awareness Program Plan describes the overall program in detail. The program is designed to maintain the flow of information pertaining to waste minimization and pollution prevention and to facilitate activities to implement real reductions in waste generation. A summary description of the four key elements of the Waste Minimization and Pollution Prevention Program includes a promotional campaign, information exchange, a waste tracking system, and waste assessment performance.

One goal of the program is to sustain an effective pollution prevention effort by improving the employee awareness of waste minimization opportunities and activities. Improved awareness is accomplished through including training, posters, publications, seminars, promotional campaigns, and recognition of individuals and teams for activities that reduce waste generation. Waste minimization activities at other ORR sites and other weapons sites provide useful input to the program. Using ideas developed by others is an important aspect that can save time and resources.

Tracking waste generation in a manner that lends itself to waste minimization reporting is a prerequisite to documenting successes or failures in waste minimization efforts. Y–12 is improving its ability to record and track waste shipments. Process waste assessments are being conducted as part of the ongoing program to identify, screen, and analyze options to reduce the generation of waste. This determines the amount of material in a workplace that is disposed of as waste during work operations. The assessment provides a summary of hazardous materials usage and waste production, and it identifies those processes and operations that need to be improved or replaced to promote waste minimization.

Spent Nuclear Fuel. Y–12 does not generate any spent nuclear fuel; however, it does store and safeguard a small amount of reactor-irradiated nuclear material in Building 9720-5, a large warehouse facility containing numerous vaults for storage. Some features of the facility are classified and it is distinguished by its high level of security. Operations consist of transfers, storage, and inventory of highly enriched uranium (HEU) in containers of various types.

High-Level Radioactive Waste. Y–12 does not generate or manage HLW.

Transuranic Waste. Y–12 does not generate or manage TRU waste.

Low-Level Waste. Machining operations that use stock materials including steel, stainless steel, aluminum, depleted uranium, and other materials produce machine turnings and fines as waste products. Waste treatment provides controlled conversion of these waste streams to an environmentally acceptable, or more efficiently handled or stored, form. This activity includes continuing operation and maintenance of facilities that treat wastewaters and solid waste generated from production and production support activities. Waste minimization and planned treatment facilities are expected to reduce the magnitude of these wastes. In 1994, Y–12 treated approximately 899,000 l (237,000 gal) of liquid LLW and 2,730 m^3 (3,580 yd^3) of solid LLW (OR LMES 1996a:5-6). Table E.2.5–1 summarizes the LLW treatment facilities at Y–12. The major facilities are described below.

The Uranium Chip Oxidation Facility thermally oxidizes depleted and natural uranium (less than 1-percent enrichment) machine chips under controlled conditions to a stable uranium oxide. Upon arrival, chips are weighed, placed into an oxidation chamber, and ignited. The oxide is transferred to drums and transported to the uranium oxide storage vaults. Since the facility is not designed to treat uranium sawfines, these are currently blended with uranium oxide and placed in the oxide vaults as a short-term treatment method.

The Waste Feed Preparation Facility processes and prepares solid LLW for volume reduction through incineration by an outside contractor or storage at Y–12. The facility utilizes a 200 t capacity baler to reduce the waste volume to one-eighth of its original size. Waste comes to the facility from areas known to generate contaminated material, or from dumpsters that were analyzed at the trash monitoring station and deemed to be above the radioactive acceptability limits for the sanitary landfill. The compacted bales are placed in DOT-approved metal boxes and staged in an adjacent warehouse prior to offsite shipment for incineration or storage at Y–12.

The Uranium Treatment Unit is near Building 9206 and was used to treat uranium-contaminated nitrate waste solutions that were generated in enriched uranium recovery operations in Buildings 9212 and 9206. The RCRA closure plan for this unit was issued in March 1995 and is awaiting approval from the State.

The Waste Coolant Processing Facility is a biodegradation and storage facility for waste coolants that may be LLW. It uses the following equipment for coolant treatment:

- Three storage tanks
- Feed tank
- Waste processing reactor/clarifier
- Sludge holding tank
- Two sludge blenders/dryers
- Effluent holding tank
- Transfer pumps

Microorganisms biodegrade approximately 114,000 l (30,000 gal) of waste coolant per month into harmless products. Each batch of coolant takes approximately 30 days to treat. After treatment, the clarifier separates the wastes into three process streams: floating oily solids, liquid effluent, and settled biological solids. Floating solids are dewatered in the dryer/ribbon blender and are transferred to drums. Liquid effluent is sent to the Central Pollution Control Facility or West End Treatment Facility/West Tank Farm for final treatment prior to NPDES discharge. Biological solids are further treated in the aeration tank and then recycled or sent through the blender for dewatering. Nonrecycled solids are currently pumped into tankers for storage. This practice will continue until adequate treatment and disposal methods are established.

Long-term storage options include warehouses, tanks, and vaults, as well as storage of Y–12 wastes in buildings at K–25. The major Y–12 LLW storage facilities, described below, are summarized in Table E.2.5–2. As of June

1995, approximately 2,320 m^3 (3,040 yd^3) of LLW and 4,740 m^3 (6,200 yd^3) of uranium-contaminated scrap metal were stored at Y–12 (OR LMES 1996a:5-12).

The Classified Waste Storage Facility will provide for the permitted storage of solid LLW and mixed LLW, which is classified for national security purposes under provisions of the AEA. These wastes are currently being stored by the waste generators. The facility, located in Building 9720-25, will meet plant security requirements for classified waste management and guidelines for the management of LLW and mixed LLW.

The Containerized Waste Storage Area near Buildings 9206 and 9212 provide storage for cans of ash resulting from the combustion of uranium-contaminated solid wastes. Combustible solid wastes contaminated with enriched uranium are ashed during the uranium recovery process. The cans of ash are stored until uranium accountability results have been obtained and the material can be returned to the uranium recovery process for further processing to recover the enriched uranium.

The Depleted Uranium Oxide Storage Vaults I and II are on Chestnut Ridge, northeast of Building 9213. The vaults are constructed of reinforced concrete and provide a retrievable storage repository for uranium oxide, uranium metal, and a blended mixture of uranium sawfines and oxide. The vaults contain a negative-pressure exhaust system that operates during material entry. The exhaust is filtered and monitored prior to its release to the atmosphere. The facility uses forklift trucks, electric hoists, and a motorized drum dumper during operation. Depleted uranium oxide and blended sawfines are delivered in sealed 113- and 208-l (30- and 55-gal) drums, with a weight limit of 386 kg (850 lb).

The Old Salvage Yard contains both low-level uranium-contaminated and nonradioactive scrap metal. Most scrap currently sent to this facility is contaminated. The Contaminated Scrap Metal Storage Area of the Old Salvage Yard is used to store uranium-contaminated scrap metal. Contaminated scrap is placed in approved containers and eventually will be transferred to above-ground storage pads. Noncontaminated scrap is sold when offsite shipments are allowed. This facility is at the west end of Y–12.

Y–12 has no current onsite LLW disposal capability. All disposal activities at the Bear Creek Burial Ground were terminated on June 30, 1991. This landfill was used to dispose of radiologically contaminated solid waste. These wastes are currently containerized and stored at Y–12 in above-grade storage pads or are shipped offsite for incineration. In 1994, approximately 1,710 m^3 (2,240 yd^3) of solid nonmetallic LLW were sent offsite to be compacted or incinerated and the ash returned to Y–12 for storage (OR LMES 1996a:5-8). Also, 1,630 m^3 (2,140 yd^3) of contaminated scrap were sent offsite to be smelted. The proposed LLW disposal facilities project would provide new disposal facilities at a centralized ORR location. The proposed LLW disposal facilities would use state-of-the-art disposal technologies, including lined trenches with leachate collection treatment capabilities and tumulus confinement disposal units. The Class-II facility, for wastes contaminated with very low concentrations of short (less than 30 years) half-life radionuclides, is expected to be operational in 2002. DOE has indefinitely postponed construction of the Class-I facility, for wastes contaminated with very low concentrations of predominantly long (greater than 30 years) half-life radionuclides.

Mixed Low-Level Waste. Mixed LLW is generated from the development, metal preparation, fabrication, and assembly/industrial engineering functions at Y–12. Mixed LLW is hazardous waste such as solvents, degreasers, biodegradable coolants, organic and inorganic acids, biodenitrification sludge, and wastewater that is contaminated with enriched and/or depleted uranium. There is no disposal of mixed waste at Y–12; however, future plans include disposal of mixed waste at a permitted offsite commercial facility. Mixed wastes are put in storage awaiting treatment or disposal, treated at Y–12, or sent to another ORR facility for treatment or disposal. Table E.2.5–3 presents the inventory of mixed LLW at Y–12 as of December 1994, along with a 5-year projection. In 1994, approximately 766,000 l (202,000 gal) of liquid mixed LLW was treated at Y–12 (OR LMES 1996a:7-6). The Y–12 Waste Management Division operates several mixed LLW treatment facilities, which are described below and are summarized in Table E.2.5–1.

The Groundwater Treatment Facility treats wastewater from the liquid storage facility at Y–12 and seepwater collected at K–25 to remove volatile and nonvolatile organic compounds and iron. The facility is part of the disposal area remedial action program to collect and treat contaminated groundwater from the Bear Creek Burial Grounds. The facility, located at the far west end of Y–12 adjacent to the West End Treatment Facility, utilizes an air stripping operation to remove volatile organics. In addition, carbon adsorption eliminates nonvolatile organics and PCBs. Iron removal equipment is also operational. After treatment, wastewater is sampled and recycled if additional processing is required. Wastewater that meets discharge specifications is pumped into East Fork Poplar Creek through an NPDES monitoring station. The Groundwater Treatment Facility treated and discharged approximately 1,206,000 l (319,000 gal) during 1992 (DOE 1994k).

The West End Treatment Facility/West Tank Farm treats the following nitrate-bearing wastes generated by Y–12 production operations: nitric acid wastes, nitrate-bearing rinsewaters, mixed acid wastes, waste coolants, mop water, caustic wastes, and biodenitrification sludges. Treatment operations consist of biological denitrification, biological oxidation, metals precipitation, coagulation, flocculation, clarification, filtration, pH adjustment, degassification, and carbon adsorption. Wastes are received at the West End Treatment Facility/West Tank Farm in 18,900-l (5,000-gal) tankers, 2,270-l (600-gal) polytanks, and in smaller, approved waste transportation containers such as drums, bottles, and carboys. Detailed waste analysis documentation is used to determine the treatment scheme and temporary storage location of each shipment. The West End Treatment Facility effluent polishing system facilitates the removal of uranium, trace metals, and suspended solids. The treated wastewater is then discharged to East Fork Poplar Creek through an NPDES monitoring station. Sludges, spent carbon and spent filter material generated during the treatment processes are currently stored in 1,890,000-l (500,000-gal) tanks. A major modification to the West End Treatment Facility/West Tank Farm is currently in the design phase. This modification will remove all heavy metals up front, thus separating the hazardous sludge from the nonhazardous sludge. Approximately two-thirds of the current sludge volume generated can then be disposed of as nonhazardous waste.

The Y–12 Cyanide Treatment Unit provides storage and treatment of waste solutions containing metallic cyanide compounds from spent plating baths and precious metal recovery operations or other areas. The cyanide reduction process is currently performed in 208-l (55-gal) containers. After waste is treated at the Cyanide Treatment Unit, it is transferred to the West End Treatment Facility, where it is further treated then discharged to the East Fork Poplar Creek.

As of June 1995, approximately 15,000 m^3 (19,600 yd^3) of mixed LLW were projected to be stored at Y–12 (OR LMES 1996a:7-21). Table E.2.5–2 summarizes the mixed LLW storage facilities at Y–12 that are described below.

The Containerized Waste Storage Area consists of three concrete pads covering approximately 2,320 m^2 (24,800 square feet [ft^2]). These pads provide storage for LLW, RCRA hazardous, and mixed LLW. An impermeable dike surrounding each pad provides 0.3 m (1 foot) of spill containment. Fire protection at this facility will be upgraded, contingent on funding.

The Building 9811-1 RCRA Storage Facility (OD7 and OD8) contains a diked tank storage area (OD7) and an enclosed containers storage area (OD8) with a capacity of 1,000 drums. OD7 contains four 114,000-l (30,000-gal) tanks, two 37,900-l (10,000-gal) tanks, and associated piping and pumps. At OD8, RCRA waste oil/solvent mixtures containing various concentrations of chlorinated and nonchlorinated hydrocarbon solvents, uranium, trace PCBs, and water for specific chemical constituents are stored in 208-l (55-gal) drums and 1,140-l (300-gal) Tuff-tanks to await sampling and analytical results. Wastes deemed compatible with OD7 materials are pumped into the OD8 Tuff-tanks. Noncompatible wastes are transported to other facilities.

The Waste Oil/Solvent Storage Facility (OD9), a permitted RCRA/TSCA hazardous waste storage facility, consists of a diked area supporting five 151,000-l (40,000-gal) tanks, a tanker transfer station with five centrifugal transfer pumps, and a drum storage area. Three tanks house PCB wastes contaminated with uranium, one tank contains nonradioactive PCB wastes, and one tank holds RCRA hazardous wastes. A diked and covered pad furnishes space for 33 m^3 (43 yd^3) of containerized wastes. Wastes assigned to this facility are first stored at OD8 (Building 9811-1 RCRA storage facility) to await laboratory results. The diked area has additional space for a sixth 151,000-l (40,000-gal) tank. This facility is projected to be used until 2010, due to the anticipated lack of disposal outlets for uranium-contaminated organic liquids.

The Liquid Organic Waste Solvent Storage Facility (OD10) contains four 24,600-l (6,500-gal) and two 11,400-l (3,000-gal) stainless steel tanks for storage of ignitable nonreactive liquids, including those contaminated with PCBs and uranium. In addition, a diked and covered storage area provides space for 40,000 l (10,600 gal) of containerized waste. The facility is capable of segregating various spent solvents for collection and storage. Major solvent waste streams are transferred to tanks until final disposition.

The Building 9720-9 Storage Area has a drum storage area for mixed and PCB wastes, including an area designed to contain flammable wastes. The western half of the facility, with space for approximately 1,500 drums, stores both PCB and RCRA hazardous waste. The facility's eastern half is not currently in use. Upgrades are under way on ventilation, diking, and fire-suppression systems to comply with RCRA, TSCA, and DOE standards and to allow for mixed and PCB waste storage.

The RCRA Staging and Storage Facility (Building 9720-31) prepares solid, liquid, and sludge wastes for offsite shipment. The facility consists of seven storage rooms and seven staging rooms, each with a separate ventilation system. The staging rooms house small containers that are packed with compatible materials and shipped. The storage rooms hold larger containers, such as 208-l (55-gal) drums. Each room, which can hold up to 90 drums, accommodates a different class of hazardous waste.

The RCRA and PCB Container Storage Area (Building 9720-58) is a warehouse facility used for staging prior to treatment or disposal of PCB-contaminated equipment (transformers, capacitors, and electrical switchgear) and nonreactive, nonignitable RCRA waste contaminated with uranium. Waste containers received at Building 9720-58 include 114- and 208-l (30- and 55-gal) drums, 1,250- and 2,500-l (330- and 660-gal) portable tanks, B-25 boxes, and self-contained PCB equipment.

The Solid Storage Facility provides 1,630 m^2 (17,500 ft^2) of storage space for PCB- and uranium-contaminated soil. The facility also has a synthetic liner for leachate collection and a leak detection system. Collected leachate is transferred to the liquid storage facility for pretreatment. The solid storage facility is currently undergoing the RCRA Part B permitting process. No additional wastes are being added to the facility.

Hazardous Waste. Plating rinsewaters; waste oil and solvents from machining and cleaning operations; contaminated soil, soil solutions, and soil materials from RCRA closure activities; and waste contaminated with hazardous constituents from construction/demolition activities are the major sources of hazardous waste at Y–12. In 1994, approximately 15,500,000 l (4,090,000 gal) of hazardous liquid were treated (OR LMES 1996a:6-3). [Text deleted.] In 1994, approximately 190 m^3 (250 yd^3) of PCB hazardous material was shipped offsite for treatment (DOE 1995h). The Y–12 Waste Management Division operates several hazardous treatment facilities that are described below and are summarized in Table E.2.5–4.

The Plating Rinsewater Treatment Facility treats dilute plating rinsewaters contaminated primarily with chromium, copper, nickel, and zinc. It can also treat cyanide-bearing wastes and remove chlorinated hydrocarbons. The design capacity for this facility is 30.3 million l/yr (8 million gal/yr). Under normal conditions, the facility treats 852,000 l (225,000 gal) of plating rinsewater per year (DOE 1995gg). The facility is across the street from the Building 9401-2 Plating Shop, which produces most of Y–12's rinsewaters. The facility neutralization, equalization, and cyanide destruction equipment is located outdoors in a diked basin. The remainder of the process is located in Building 9623. Rinsewaters are received via a direct pipeline from the plating shop, but they can also be received in tankers, polytanks, or in any acceptable waste shipping container. The Plating Rinsewater Treatment Facility performs the following treatment operations: potential of hydrogen (pH) adjustment, flow equalization, heavy metal removal by electrochemical precipitation, flocculation, and clarification. After the clarification operation, the rinsewater is transferred to the Central Pollution Control Facility. That facility provides the carbon adsorption operation, final filtration, and discharge to East Fork Poplar Creek through an NPDES monitoring station. Treated rinsewater is sometimes recycled for use as makeup water for Central Pollution Control Facility processes. Sludge from the clarification process is transferred to the Central Pollution Control Facility, then taken to the West Tank Farm for interim storage.

The Steam Plant Wastewater Treatment facility treats approximately 233 million l/yr (61.5 million gal/yr) of wastewater from steam plant operations, demineralizers, and coal pile runoff (OR LMES 1996a:8-4). Treatment processes include wastewater collection/sedimentation, neutralization, clarification, pH adjustment, and dewatering. The facility, which is managed by the Y-12 utilities department, uses automated processes for continuous operation. All solids generated during treatment are nonhazardous and are disposed of in the sanitary landfill. The treated effluent is monitored prior to NPDES discharge to the East Fork Poplar Creek.

Hazardous waste is being stored until the management and operations contractor and DOE approve shipment for offsite disposal under the DOE "No Rad Added" performance objective. As of June 1995, approximately 34 m^3 (44 yd^3) of hazardous waste was stored at Y-12 (OR LMES 1996a:6-6). Table E.2.5-5 summarizes some of the major existing Y-12 hazardous waste storage facilities described below.

The Oil Landfarm Soils Storage Facility contains approximately 420 m^3 (550 yd^3) of soil contaminated with PCBs and volatile organics (OR DOE 1993a:9-21). The soil was excavated from the oil landfarm and tributary 7 in 1989. The soil is contained in a covered, double-lined concrete dike with a leak-detection system. The leak-detection system will soon be modified to enhance detection capabilities.

The Liquid Storage Facility of the Disposal Area Remedial Actions Liquid Storage Treatment Unit is a hazardous waste storage facility built during the Bear Creek Burial Ground closure activities. It is located in Bear Creek Valley approximately 3.2 kilometers (2 miles) west of Y-12. It collects and stores groundwater and other wastewaters received from the seep collection lift station, the solid storage facility, tankers, polytanks, and the diked area rainfall accumulation. Feed streams may contain oil contaminated with PCBs, volatile and nonvolatile organic compounds, and heavy metals. Processing and storage equipment include:

- Two 284,000-l (75,000-gal) bulk storage tanks
- 22,700-l (6,000-gal) oil storage tank
- Gravity separator
- Filtering unit
- Composite sampling station
- Tanker transfer station

The wastewater travels through the gravity separator, cartridge filters, and composite sampling station prior to storage in the bulk tanks. A reinforced concrete dike surrounds all equipment to provide spill containment. After sufficient wastewater accumulates in the bulk storage tanks, it is processed at the groundwater treatment facility. A new leachate collection system collects and pumps hazardous waste seepage from the burial ground to the Liquid Storage Facility.

The Y-12 Waste Management Division operates Industrial Landfill V, which is used for disposal of industrial and institutional solid waste and special waste, such as asbestos materials, empty aerosol cans, materials contaminated with glass, fly ash, coal pile runoff sludge, empty pesticide containers, and steam plant wastewater treatment facility sludge. The landfill area is on Chestnut Ridge, near the eastern end of the plant, and serves Y–12, Oak Ridge National Laboratory (ORNL), K–25, and other DOE prime contractors at Oak Ridge. The landfill utilizes shallow land burial by the area fill method and is permitted by the State of Tennessee. Requests are filed with the state to provide disposal for additional materials as needed.

The Chestnut Ridge borrow area waste pile (Industrial Waste Landfill III) consists of mercury-contaminated soil removed from the Oak Ridge Civic Center area and deposited at Y–12 Chestnut Ridge. No other waste has been disposed of at this site.

Nonhazardous Waste. Major waste-generating activities include construction and demolition activities that produce large volumes of noncontaminated wastes, including lumber, concrete, metal objects, soil, and roofing materials. Industrial trash is generated by daily operations throughout the plant. These operations include janitorial services, floor sweepings in production areas, and production activities. In 1994, the Y–12 Plant generated 228 million l (60.3 million gal) of industrial and sanitary liquid waste that included oils and solvents, operational wastewater, Central Pollution Control Facility/Plating Rinsewater Treatment Facility wastewater, steam plant wastewater, environmental restoration waste, and liquid waste received from ORNL and K–25 (OR LMES 1996a:8-3). The waste storage facility in Building 9720-25 has a solid waste baler with an 8:1 compaction ratio (DOE 1994n). Approximately 41,700 m^3 (54,700 yd^3) of solid nonhazardous waste was compacted and/or stored during 1994 (OR LMES 1996a:8-3).

The Sludge Handling Facility (T-118) was designed and constructed to provide water filtration and sludge dewatering in support of a storm sewer cleaning and relining project. Filtered water was reused by the sewer-cleaning contractor, and the dewatered sludge was stored in specially constructed containers for future disposal. The facility is currently being used to store containers of LLW.

The Steam Plant Ash Disposal Facility is used to collect, dewater, and dispose of sluiced bottom ash generated during operation of the coal-fired steam plant. An additional trench was constructed for the disposal of sanitary and industrial wastes generated by ORNL, K–25, and Y–12. In order to comply with environmental regulations for landfill operations, the Steam Plant Ash Disposal Facility includes a leachate collection system, a transfer system to discharge the collected leachate into the Oak Ridge public sewage system, groundwater monitoring wells, and a gas migration/ventilation system.

In 1992, approximately 677 m^3 (887 yd^3) of clean scrap metal was stored at Y–12 (OR DOE 1993b:9-6). The New Salvage Yard is used for the staging and public sale of nonradioactive, nonhazardous scrap metal. Sales have been suspended, however, until procedures to meet the DOE "No Rad Added" performance objective have been approved. The New Salvage Yard provides accumulation and sorting activities for nonradiologically contaminated scrap metal. Plans are in place to provide an automotive lead cell battery repository for used batteries until recycling options are initiated. This facility is located near the Bear Creek Burial Ground.

The new Industrial Landfill V and Construction Demolition Landfill VI permit disposal of 93,500 m^3/year (yr) (122,000 yd^3/yr) of industrial and sanitary waste (OR LMES 1996a:8-7). The facilities were designed and are operated in accordance with Tennessee solid waste disposal regulations. A baler, located in Building 9720-25, is used to compact sanitary/industrial waste destined for Industrial Landfill V.

Oak Ridge National Laboratory

Because ORNL is a research facility, it has many diverse waste-generating activities, each of which may produce only a small quantity of waste. Isotope production, utilities, and support functions such as photography are additional sources of waste. The radioactive wastes produced by each activity reflect the nature of its operation. A large number of radioisotopes are handled in isotope production and packaging, in reactor and accelerator operations, in reprocessing studies on nuclear fuel, and in investigations into the interactions of radioactivity with living systems. The radioactive wastes generated by these activities can be classified as follows:

- Concentrates generated by the treatment of intermediate-level wastes, which are disposed of by hydrofracture.
- LLW contaminated with beta/gamma-emitting radioactivity. These wastes, which have a low surface dose rate, are compacted if possible and disposed of in earthen trenches; those wastes which exhibit a high surface dose rate are disposed of in augered holes.
- TRU wastes, which are retrievably stored.
- Low-level alpha-emitting wastes, which are evaluated for criticality hazards before disposal in augered holes.

Pollution Prevention. Waste segregation is used to minimize the generation of solid LLW. By providing collection barrels for both radioactive and nonradioactive wastes, the volume of wastes that requires handling as radioactive waste has been reduced. Before these procedures were implemented, radioactive and nonradioactive wastes were discarded in the same barrel. This contaminated the nonradioactive portion and inflated the amount of waste that required special disposal.

Spent Nuclear Fuel. ORNL generates small quantities of spent nuclear fuel. Several facilities are used to house spent nuclear fuel (DOE 1993r:28-29):

- The Irradiated Fuels Examination Laboratory (Building 3525) only contains hot cells. Disassembly and examination of irradiated fuel and components continue to be the mission of the facility.
- The High Level Radiochemical Laboratory (Building 4501) contains centrally located hot cells supported by various laboratories capable of handling radioactive material. It has been used in performing work on fission gas release in light water reactor fuel rods. The spent nuclear fuel is in dry storage.
- The Radiochemical Engineering Development Center (Building 7920) is a multipurpose hot cell facility with the appropriate equipment, shielding, and containment provisions to safely process and store large quantities of highly radioactive fuel elements. It was specifically built to prepare and process targets for the High Flux Isotope Reactor.
- The Bulk Shielding Reactor, a pool-type research reactor, is currently shut down and its core is stored in racks. Fuel assemblies from the Oak Ridge research reactor are also stored in the pool.
- The High Flux Isotope Reactor is an 85-megawatt (MW), beryllium-reflected, light-water-moderated, flux-trap-type research reactor with associated support equipment and a storage pool. Missions include production of isotopes for medical and industrial applications, neutron-scattering experiments, and various material irradiation experiments. This is the only reactor that is still generating fuel elements that will need storage in the future.
- The Molten Salt Reactor Experiment is an 8-MW, homogeneous reactor consisting of uranium fluoride fuel in molten lithium salt. Its purpose was to test the practicality of a molten-salt reactor concept for central power station applications. The fuel is being stored in the salt storage tanks beneath the reactor.

- The Tower Shielding Reactor is a reactor facility where experiments were conducted outdoors on a remote hilltop. It is a spherically symmetric 1-MW plate-type reactor. The purpose of the facility was to conduct large-scale experiments to test shielding design methods and obtain associated data. The original core is located in the reactor. Four fuel plates are stored in the underground site, and 1,200 low-enriched fuel pins are stored in DOT shipping containers.

- Wells 7823A/7827/7829 are stainless-steel dry wells placed in the ground to provide shielded, retrievable storage facilities. They are currently closed to further storage. The wells were used to store irradiated fuel and associated fission products from 1972 to 1989.

- Waste Area Grouping 7 (Homogeneous Reactor Experiment wells) consists of seven augered holes that were drilled in 1964 to store 511 l (135 gal) of a 40-molar fuel solution. Each well was filled to ground level with soil and marked by a concrete plug and brass plaque.

- The Classified Burial Ground is now closed to operations but in the past, fuel materials were buried there. The exact quantity and location of all this material is not known.

- Solid Waste Storage Area 6 houses the suspension test reactor fuel. Seven of the underground dry-storage units are empty, although one unit has been found to contain water and another contains moist sand. These units are, therefore, not available for additional storage.

- The Building 9720-5 Vault houses the fissile components of the health physics research reactor, a DOE demonstration reactor, and the Space Nuclear Auxiliary Power-10A reactor. The building also stores HEU, which would require significant coordination with safeguards and security as well as transportation personnel.

A summary table of the inventory of reactor-irradiated nuclear material is shown in Table E.2.5–6.

High-Level Radioactive Waste. ORNL does not generate or manage HLW.

Transuranic Waste. Table E.2.5–7 presents the inventory of TRU and mixed TRU wastes at ORNL as of December 31, 1994, along with a 5-year projection. As of December, 1994, approximately 654 m^3 (857 yd^3) of contact-handled TRU waste were stored at ORNL. The amount of remote-handled TRU waste was approximately 59 m^3 (78 yd^3) (DOE 1995gg). Approximately 748 m^3 (973 yd^3) and 1,656 m^3 (2,153 yd^3) is contact and remote-handled mixed TRU, respectively. The bulk of ORNL's mixed TRU waste is in three liquid/sludge waste streams that are currently stored in tanks. Each tank's wastes must be remotely handled because of the high radioactivity. ORNL's underground storage tank management program includes implementation of leak detection, corrosion protection, spill and overflow protection, annual tightness testing, operational controls, record keeping, reporting, and replacement of those systems that cannot be upgraded by 1998. The program also addresses the immediate removal from service and remediation of sites with tanks found to be leaking, and it implements any required closures, corrective actions, and any upgrading and/or replacement of affected tanks in accordance with the regulatory requirements. Status of the tanks managed under the *Underground Storage Tank Program* is as follows:

- Twenty-six tanks have been excavated or permanently taken out of service (20 have been approved by Tennessee as closed; 6 require additional investigation and/or corrective action before final closure approval).

- Twenty-four tanks are deferred from 40 CFR 280. These will be taken out of service or upgraded.

- Two tanks were upgraded in 1990 to meet the current leak-detection requirements.

- Two tanks contain heating oil and are excluded from regulation under 40 CFR 280.

- Five tanks contain waste oil contaminated with radionuclides and are excluded under 40 CFR 280.

Solid TRU waste consisting of filters, paper, metals, and other items is generated at ORNL through laboratory, pilot plant, and reactor operations. This includes both contact-handled and remote-handled waste contaminated with lead and, in some cases, mercury. Since there is no TRU waste treatment facility at ORNL, generated TRU waste is being placed in retrievable storage. Contact-handled TRU waste is predominantly packaged in drums, while remote-handled waste is packaged in concrete casks. In 1994, approximately 105 m^3 (138 yd^3) of contact-handled and 63 m^3 (83 yd^3) of remote-handled TRU waste were placed in storage (OR LMES 1996a:4-4a). Current activities center around certification of contact-handled waste, planning and designing of a repackaging and certification facility for remote-handled wastes, and planning for shipment of wastes to WIPP or another suitable repository should WIPP prove to be unsatisfactory. The repackaging facility, located in Building 7880, is called the waste handling and packaging plant and is planned for 2001. Tables E.2.5–8 and E.2.5-9 summarize the storage and treatment facilities for TRU and mixed TRU wastes at ORNL.

The ORNL Waste Examination and Assay Facility, Building 7824, is used primarily for nondestructive examination and assay of the contents of waste containers of TRU wastes and LLW to verify compliance with the receiving (storage or disposal) facility waste acceptance criteria. The facility is also used for the nondestructive assay of nonwaste materials. It is located within the confines of SWSA-5 in the Melton Valley area of ORNL.

Low-Level Waste. Isotope production and research activities generate a variety of liquid LLW, including low-level wastewater. Sources of solid LLW include contaminated equipment, filters, paper, rags, plastic, and glass and sludge from the process waste treatment plant. Table E.2.5–9 shows the LLW treatment facilities that are operating at ORNL. In 1994, 143 m^3 (187 yd^3) of solid LLW were received prior to compaction and 189,000 l (49,800 gal) of liquid LLW were solidified at ORNL (OR LMES 1996a:5-7). Approximately 462 m^3 (605 yd^3) were sent offsite to be compacted and/or incinerated (OR LMES 1996a:5-8).

Solid LLW, including scrap metal, is placed in storage prior to disposal. As of June 1995, approximately 1,690 m^3 (2,210 yd^3) of solid LLW and 2,970 m^3 (3,890 yd^3) of radioactive scrap metal were in storage awaiting disposal at ORNL (OR LMES 1996a:5-13). Table E.2.5–10 lists the LLW and mixed LLW storage facilities currently operating at ORNL.

The SWSA-6 area at ORNL is the only active onsite disposal unit at ORR. It receives solid LLW from ORNL only, including radioactively contaminated asbestos. As of the end of 1995, approximately 340 m^3 (445 yd^3) of solid LLW were buried at SWSA-6 (OR LMES 1996a:5-16). This does not include 355 m^3 (465 yd^3) buried at three silos and a trench that was closed at the end of 1993 (OR MMES 1995c:5-29). Table E.2.5–11 lists the LLW disposal facilities at SWSA-6.

Mixed Low-Level Waste. Mixed wastes are generated by research projects and some facility operations. Isotope production and research activities generate a variety of mixed low-level and mixed TRU wastes. Table E.2.5–12 presents the inventory of mixed LLW at ORNL as of December 31, 1994, along with a 5-year projection.

As shown in Table E.2.5–9, three facilities are currently treating mixed waste at ORNL: the Process Waste Treatment Plant, the Liquid LLW Evaporation Facility, and the Melton Valley LLW Immobilization Facility (DOE 1995gg). One other treatment facility, the Nonradiological Wastewater Treatment Plant, is operating and could be used to treat mixed waste.

The Process Waste Treatment Plant is designed to treat process wastewaters, groundwater, and evaporator condensate wastewaters that contain low levels of radioactivity. Small concentrations of radioactive materials have occasionally been processed. Process wastewaters may contain small quantities of radionuclides, metals, anions, and organic chemicals. Under normal operating conditions, the process waste treatment plant can process wastewater at a rate of 492 l/minute (min) (130 gal/min). The design capacity is 757 l/min (200 gal/min) (DOE 1993h:26.2-5). Wastewaters can contain organic materials and low levels of radioactivity. The facility can treat waste streams with some heavy metals but not streams containing PCBs.

The Liquid LLW Evaporation Facility treats liquid LLW and mixed LLW using evaporation. It operates in a semicontinuous mode; waste is accumulated in collection tanks and transferred through underground piping to an evaporator system. The design capacity is 106,000 l/day (28,000 gal/day). The facility processes an average of 1,140 l (301 gal) of liquid wastes per day under normal operating conditions (OR DOE 1993a:9-22). The facility can treat waste streams containing organic contaminants.

Table E.2.5–10 summarizes the mixed LLW storage facilities at ORNL and estimates the capacity of these facilities. As of June 30, 1995, approximately 1,600 m^3 (2,100 yd^3) of mixed waste was projected to be in storage at ORNL (OR LMES 1996a:7-21).

The only disposal of mixed waste done at ORNL is the burial of radioactive asbestos at SWSA-6. Asbestos contaminated with low levels of radioactivity is placed in silos. In 1992, approximately 23 m^3 (30 yd^3) of contaminated asbestos were buried (OR DOE 1993b:9-4). Low-level contaminated biological waste has also been buried at SWSA-6.

Hazardous Waste. Hazardous wastes are generated in laboratory research, electroplating operations, painting and maintenance operations, descaling, demineralizer regeneration, and photographic processes. Few hazardous wastes are treated in onsite facilities. Onsite treatment at ORNL includes elementary neutralization and detonation facilities. Tables E.2.5–10 and E.2.5–13 summarize the hazardous waste storage and treatment facilities at ORNL. [Text deleted.]

The Chemical Detonation Facility treats small amounts of wastes that would be dangerous to transport offsite. Explosives such as aged picric acid are detonated in the detonation facility. Certain other wastes (for example, spent photographic processing solutions) are processed onsite into a nonhazardous state. Those wastes that are safe to transport are shipped to offsite RCRA-permitted commercial treatment/disposal facilities.

The Nonradiological Wastewater Treatment Plant is designed to reduce hazardous pollutant concentrations in nonradiological wastewaters to levels acceptable for effluent discharge. The plant operates in a continuous mode and carries out physical and chemical processing steps. The facility contains a heavy-metal removal system, where the pH of the wastewater is raised to 10.5 in a clarifier. Polymers are added to induce flocculation and settling of the metal precipitates. The wastewater is passed through a filtration system to remove particulates. An air stripper then removes volatile organics and activated carbon columns remove mercury. In 1993, approximately 23,800,000 l (6,300,000 gal) of liquid hazardous wastes were treated at the Nonradiological Wastewater Treatment Plant (OR MMES 1995c:6-6).

As of June 1995, approximately 29 m^3 (38 yd^3) of hazardous waste was stored at ORNL (OR LMES 1996a:6-6). PCB wastes are managed in storage facilities until they can be shipped offsite for treatment and/or disposal. PCB-contaminated and hazardous wastes are temporarily stored at Building 7507, and PCB-contaminated wastes are stored on the 7507W storage pad. Due to the "No Rad Added" policy, hazardous wastes are being stored as mixed waste. A listing of the hazardous waste storage facilities at ORNL is shown in Table E.2.5–14. In 1992, approximately 10 m^3 (13 yd^3) of asbestos wastes were sent to Y–12 Sanitary and Industrial Landfill II. About 12 m^3 (16 yd^3) of hazardous and PCB wastes were sent to K–25 for storage and incineration in the TSCA incinerator (OR DOE 1993b:9-5).

Nonhazardous Waste. Nonhazardous wastes result from ORNL maintenance and utilities. The steam plant and the sanitary waste treatment plant produce a sludge which is sampled to demonstrate that it is nonhazardous and meets the Y–12 Industrial and Sanitary Landfill II waste acceptance criteria. The sewage treatment facility treats sanitary and laundry wastewater. It is an extended aeration-activated sludge unit followed by mixed-media tertiary filtration of secondary effluent dewatering. The sludge is dried onsite in open-air drying beds. In 1994, approximately 360 million l (95 million gal) of industrial and sanitary liquid waste were treated at the sewage treatment plant (OR LMES 1996a:8-4).

The Melton Valley LLW Immobilization Facility is currently treating nonhazardous liquid waste (OR DOE 1994a:A-20). The facility can be used to solidify liquid mixed LLW that has a pH greater than 12.5 and that contains some heavy metals. This liquid mixed LLW is transferred from tanks by interconnecting pipelines. Batches of waste are pumped from a liquid decantation system to a solidification system as required to provide adequate storage-tank capacity. The facility operates on a campaign basis in order to provide adequate storage capacity. Solidification is currently performed using cementation. Design capacity is 62,500 l (16,500 gal) of liquid waste per month. Under normal operating conditions, the facility can process 7,570 l/month (2,000 gal/month) as required to provide adequate storage-tank capacity (DOE 1993h:26.2-5). The facility cannot treat HLW, alpha-contaminated waste with TRU activity levels greater than 100 nanocuries per gram (nCi/g), organic wastes, or PCBs.

Scrap metals are discarded from maintenance and renovation activities and are recycled when appropriate. Construction and demolition projects also produce nonhazardous industrial wastes. All solid nonhazardous wastes and medical wastes (after they are autoclaved to render them noninfectious), except scrap metal, are sent to Y–12 Industrial and Sanitary Landfill II. Approximately 16 m^3 (21 yd^3) of scrap metal were placed in storage at ORNL in 1992. This waste will remain at ORNL until it is characterized as nonradioactive per the "No Rad Added" policy (OR DOE 1993b:9-7).

Rainfall runoff from the ORNL Steam Plant coal yard storage area, plus additional wastewater from the sulfuric acid tank diked area runoff, Steam Plant boiler blowdown, and water softener regenerate, are collocated in a basin. This waste is treated at the Coal Yard Runoff Treatment Facility.

K–25 Site

Enrichment, maintenance, decontamination, and research and development activities have generated a wide variety of waste at K–25. Because of its past uranium enrichment mission, uranium is the predominant radionuclide found in K–25 waste streams. Waste management activities are increasing. Low-level radioactive wastes from other DOE sites are placed in building vaults until a final disposition strategy is identified. Also, PCB wastes and RCRA wastes contaminated with uranium began arriving from other DOE sites in 1987 for incineration in the K-1435 TSCA incinerator. Tables E.2.5–15 and E.2.5–16 summarize the treatment and storage facilities at K–25 that are capable of treating and storing multiple categories of waste.

Pollution Prevention. K–25 policy mandates minimization of waste generated while achieving compliance with applicable environmental regulations. Five waste reduction options are used at K–25: segregation, material substitution, process innovation, mechanical volume reduction, and recycling/reuse. In recent years, some aluminum cans, worker clothing, and office furniture have been recycled for use at K–25. As of 1991, this recycling had saved approximately 1,150,000 kg (2,520,00 lbs) of materials. K–25 management supports the waste reduction program. An example of this program is the conversion to gas-fired boilers to reduce capacity excursions and, in effect, reduce or eliminate fly ash production.

Spent Nuclear Fuel. K–25 does not generate or manage spent nuclear fuel.

High-Level Radioactive Waste. K–25 does not generate or manage HLW.

Transuranic Waste. K–25 does not generate or manage TRU waste.

Low-Level Waste. Solid LLW is generated by discarding radioactively contaminated construction debris, wood, paper, asbestos and trapping media. Solid LLW is also generated by process equipment and by removing radionuclides from liquid and airborne discharges. Currently, solid LLW is being stored for future disposal. Table E.2.5–17 shows the storage facilities that deal only with LLW. [Text deleted.] Treatment of the current inventory of contaminated scrap metal at K–25 (as well as at Portsmouth, Paducah, and Fernald facilities) is expected to occur over the next 3 to 5 years as part of a comprehensive DOE scrap metal program to be managed through K–25. All contaminated scrap metal is stored aboveground at the K-770 scrap metal facility until further disposal methods are evaluated.

The Uranium Hexafluoride (UF_6) Cylinder Program is directed toward improving the safety and reliability of long-term storage for 7,000 cylinders currently at K–25. These cylinders remain from the now-terminated gaseous diffusion mission. In storage at the site are approximately 5,000 9-t (10-ton) and 13-t (14-ton) cylinders of depleted UF_6; 1,000 cylinders of normal-assay feed UF_6; 400 cylinders containing more than 23 kg (50 lb) of "enriched" material; and 600 miscellaneous empty cylinders. The UF_6 Cylinder Program is being designed to develop a clear understanding of the current conditions of the cylinders and define any near-term and long-term actions for safe storage of the cylinders pending decisions on ultimate disposition of the UF_6 material. Some of the initial actions in the program are a baseline inspection, a corrosion coupon program, and an ultrasonic thickness measurement program. The baseline inspection identified a variety of cylinder defects that will require special attention and also identified four breached cylinders. Immediate corrective actions have been taken to handle the breached cylinders, and a schedule of activities has been developed for moving and repairing the cylinders.

The cylinders containing normal-assay feed UF_6 are currently being shipped to the Paducah Gaseous Diffusion Plant. The current DOE direction for the 5,000 cylinders with depleted UF_6 is to store them until at least the year 2020, at which time conversion to oxide will be performed if no other uses have been determined. A plan for cleaning the empty cylinders and those containing more than 110 kg (50 lb) of enriched material has not yet been approved (this may be performed at K–25 or at one of the operating gaseous diffusion plants).

Currently, there are no onsite disposal facilities being operated at K–25. An ORR centralized waste management organization has been established at K–25 and assigned the responsibility of designing, constructing, and operating all new LLW disposal facilities for the ORR.

Mixed Low-Level Waste. Mixed LLW primarily consists of contaminated waste oils, solvents, sludges, soils, and acid wastes. Table E.2.5–18 presents the inventory of mixed LLW as of December, 1994, along with a 5-year projection. Sludges contaminated with low-level radioactivity were generated by settling and scrubbing operations and were stored in K-1407B and K-1407C ponds. Sludges have been removed from these ponds, and a portion has been fixed in concrete at the K-1419 sludge treatment facility and stored at the K-33 Building. These materials are considered mixed LLW and will be shipped offsite for disposal at a permitted commercial facility.

Most of the treatment of mixed waste is at the TSCA incinerator and the central neutralization facility. The majority of waste treated at the TSCA incinerator cannot be treated by commercial incinerators because of radioactive contamination. All waste sent to this facility must be fully characterized and identified. DOE has an approved chain-of-custody system for all waste received from offsite. The K-1435 TSCA incinerator is capable of incinerating waste that is mixed or contains PCBs. In 1990, a limited amount of waste was incinerated as a part of the startup testing. The incinerator began full operations in early 1991 and met all regulatory requirements in processing 1,000 m^3 (1,310 yd^3) of mixed waste. Mixed TSCA waste is being generated in the ash residue at the TSCA incinerator. Compliance issues regarding the management of the mixed PCB and radioactive waste generated in the ash are being pursued with EPA by DOE.

Most of the radioactively contaminated wastewater treated at the central neutralization facility is generated at the TSCA incinerator from the wet scrubber blowdown. Treated effluents are discharged through a designated release point. The contaminated sludges that precipitate in the sludge-thickener tank are stored in an approved above ground storage area at K–25.

RCRA mixed, radioactive land disposal restricted waste (including some nonradiological classified land disposal restricted waste) has been stored in some areas for longer than 1 year. These wastes are currently subject to the land disposal restriction that permits storage only for accumulation of sufficient quantities to facilitate proper treatment, recycling, or disposal. This waste is being stored because of the nationwide shortage of treatment and disposal facilities for this type of waste. Private-sector technology demonstrations are being conducted that involve uranium extractions from sludge.

Uranium-contaminated PCB wastes (that is, mixed wastes) are being stored in excess of the 1-year limit imposed by TSCA because of the lack of treatment and disposal capacities. DOE and EPA have signed an FFCA, effective February 20, 1992, to bring the facility into compliance with TSCA regulations for use, storage, and disposal of PCBs. It also addressed the approximately 10,000 pieces of nonradioactive PCB-containing dielectric equipment associated with the shutdown of diffusion plant operations.

In 1989, during routine inspections of the drums of stabilized K-1407 pond sludge at the K-1417 storage facility, it was discovered that many of the drums had begun to corrode. Free liquid (waste with a pH of 12) on top of the concrete in the drums was found to be causing the corrosion (OR DOE 1993a:9-16). An action plan has been implemented to decant and/or dewater the mixed waste contained in the drums. A total of 45,000 drums of stabilized material and 32,000 drums of raw sludge must be processed and moved to storage facilities that meet regulations governing mixed wastes. All containers will be transferred to and stored in new and existing facilities at the K-1065, K-31, and K-33 buildings.

Hazardous Waste. Hazardous wastes generated at K–25 include PCB articles and items, waste oils and items, and uncontaminated asbestos waste. All hazardous wastes are managed according to applicable State and Federal regulations and DOE Orders. Several waste management facilities are already in place. Changing laws and regulations have made it necessary to upgrade several facilities and to design and construct new facilities that reflect the most recent environmental technology. The Central Neutralization Facility and the TSCA incinerator are the two major facilities that treat hazardous waste.

The Central Neutralization Facility provides pH adjustment and chemical precipitation for several aqueous streams throughout K–25. The main purpose of the facility is to treat wastewater to ensure compliance with the requirements of NPDES discharge limits on pH, heavy metal concentrations, and suspended solids. The treatment system consists of two 94,600-l (25,000-gal) reaction tanks and a 227,000-l (60,000-gal) sludge-thickener tank. Acidic wastes are neutralized with a hydrated-lime slurry, and basic wastes are neutralized with sulfuric or hydrochloric acid. The hydrated-lime bin and acid tanks are located at the facility. The treatment facility is physically divided into separate sections for treating hazardous and nonhazardous waste streams.

The TSCA Incinerator consists of storage tanks, dikes, and the incinerator. The incinerator system consists of a liquid, solid, and sludge feed system; a rotary kiln incinerator; and a secondary combustion chamber. The wastes treated at this facility include oils, solvents, chemicals, sludges, and aqueous waste.

As of June 30, 1995 approximately 76 m^3 (100 yd^3) of hazardous waste was stored at K-25 (OR LMES 1996a:6-6). In general, most of the waste stored at K–25 is designated as hazardous waste that has been contaminated with PCBs. Recyclable materials, such as mercury and silver-bearing photographic wastes, are stored before recycling, while other hazardous wastes are stored until sufficient quantity is accumulated for an offsite shipment. All offsite disposals of hazardous wastes, were halted in 1991 until procedures addressing a DOE performance objective of "No Rad Added" were developed by the sites and approved by DOE. Incineration is the preferred method for offsite treatment or disposal of wastes, particularly PCB wastes; however, landfills and other types of disposal are used as needed. On the K–25 site all hazardous waste is treated as mixed LLW.

Nonhazardous Waste. Computer paper is being recycled from the K–25 computer technology center. The paper recycling program is being reviewed for expansion into nonradiological areas. Product substitutions at the paint shop and photography lab have resulted in a decrease of waste generation. No percentage of reduction has been calculated due to the lack of baseline data.

Waste assay monitors have been purchased and are being used to screen solid, potentially radioactive waste to determine the potential to manage it as nonhazardous waste. The K-770 clean scrap yard provides storage for nonradioactive scrap metal. The scrap metal is stockpiled before being sold to the public. The solid nonhazardous waste from K–25 is sent to Y–12 Industrial Landfill V. Some materials, such as furniture, file cabinets, and paper, are disposed of through property sales.

The only nonhazardous treatment facility at K–25 is the sanitary waste treatment plant (Building K-1203). The system consists of an extended aeration treatment plant with a rate capacity of approximately 2,270,000 l/day (600,000 gal/day). The current demand is about 1,140,000 l/day (300,000 gal/day) (OR LMES 1996a:8-5). The sanitary sludge is disposed of in the Y–12 landfill. The Central Neutralization Facility does treat some nonhazardous liquid waste streams.

Table E.2.5–1. Low-Level and Mixed Low-Level Waste Treatment Facilities at Y–12 Plant

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Biodenitrification Unit (Building 9818)	Neutralization, pH adjustment, nitrate removal	Liquid mixed LLW (nitrate solutions from enriched uranium recovery-Buildings 9212 and 9206)	Biosludge to West End Treatment Facility	2,100	RCRA permit-by-rule. Design capacity.
Central Pollution Control Facility	Filtration, carbon adsorption, oil/water separation, and sludge dewatering	Liquid LLW, mixed LLW, and hazardous waste (nonnitrate liquid wastes)	Treated wastewater discharged through NPDES outfall and solids to West Tank Farm	10,300	NPDES permit April 28, 1995. RCRA permit-by-rule. Design capacity.
Cyanide Treatment Facility (Building 9201-5N)	Chemical oxidation, cyanide destruction, neutralization	Liquid mixed LLW and hazardous waste (cyanide spent plating batches)	Wastewater to West End Treatment Facility	15	RCRA permit issued September 28, 1995. Also has 8 m^3 of mixed waste storage. Permitted capacity for mixed LLW. Processed 2,810 m^3 of LLW in 1994.
Groundwater Treatment Facility (Building 9616-7)	Carbon adsorption and air stripping	Liquid LLW and mixed LLW (Liquid Storage Facility groundwater)	Groundwater air stripper effluent, spent carbon, and sludge to depleted uranium oxide storage vaults and liquid effluent through NPDES outfall	9,450	Operating capacity. NPDES permit April 28, 1995. RCRA permit-by-rule. Maximum capacity is 17,700 m^3/yr. Facility is currently treating mixed waste but is intended for hazardous waste only.
Interim Reactive Waste Treatment Area	Open burning (slow thermal oxidation)	Solid LLW (sodium-potassium waste)	Treated residue waste to depleted uranium oxide storage vaults and treated waste to K–25	Campaign 2 times per year, 8 hours per campaign, 57 l/day.	RCRA permit submitted August 1992. Interim facility awaiting completion of Reactive Waste Treatment Facility. Design feedrate is 0.7 m^3/yr.
Liquid Storage Facility (Building 9416-35)	Oil/water separation by filter cartridges	Liquid mixed LLW (leachate from certain capped burial grounds in Bear Creek Valley)	Stored liquids to groundwater treatment facility and PCB-laden oil to TSCA incinerator	9,450	Also a storage unit. RCRA permit-by-rule. Facility is currently treating mixed waste but is intended for hazardous waste only.
Uranium Chip Oxidation Facility (Building 9401-5)	Thermal oxidation	Solid LLW (depleted and normal uranium chips)	Uranium oxide to Depleted Uranium Oxide Storage Vaults	Classified yearly treatment	Exempted from State air permitting requirements. Design feedrate is 1,000 kg/hr. Intermittent operation is about 2 days/week, 4 hr/day.

Table E.2.5-1. Low-Level and Mixed Low-Level Waste Treatment Facilities at Y-12 Plant—Continued

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Uranium Recovery Operations (Building 9206, 9272)	Leaching, filtration, dissolution, oxidation, evaporation, extraction	Metal and organic removal from aqueous stream, aqueous neutralization, purification for recycle	All waste diverted to Acid Waste Neutralization and Recovery Facility	2,100	System is exempt from permitting requirements under agreement with the State. Same capacity as Biodenitrification Unit. System removed from consideration for treatment.
Uranium Treatment Unit (Building 9206)	Filtration and precipitation	Liquid mixed LLW (uranium-contaminated organic solvents)	Organic waste to TSCA Incinerator at K–25	2 m^3/day	Closure plan submitted March 1995.
Waste Coolant Processing Facility (Building 9983-78)	Extended activated sludge treatment, sludge drying	Liquid LLW and mixed LLW (contaminated waste coolants)	Oily solids to dewatering and drums, biological solids to dewatering, and liquid to Central Pollution Control Facility or West End Treatment Facility/West Tank Farm	756	Also a storage unit. Maximum capacity is 1,320 m^3/yr. RCRA permit-by-rule.
Waste Feed Preparation Facility (Building 9401-4)	Compaction	Compactible solid LLW	Compacted solid LLW to Y–12 Above-Grade LLW Storage Facility	19,000	Exempted from State air permitting. Design feedrate is 23 m^3/hr. Intermittent operation at 8 hr/day and 2 days/week.
West End Treatment Facility (Building 9616-7)	Absorption, anaerobic digestion, clarification, coagulation, filtration, flocculation, and precipitation	Liquid mixed LLW and hazardous waste (radioactive-contaminated and nonradioactive nitrate waste)	Liquid effluent through NPDES outfall	2,600	Permitted capacity NPDES permit issued April 28, 1995. RCRA permit-by-rule. Design capacity is 7,600 m^3/yr.

[a] For those facilities already in use, this is a normal operating capacity, whereas for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1993h; DOE 1994k; DOE 1994n; DOE 1995gg; OR DOE 1995g; OR LMES 1996a; OR MMES 1995c.

Table E.2.5–2. Low-Level and Mixed Low-Level Waste Storage Facilities at Y–12 Plant

Waste Oil/Solvent Bulk Storage Facility	Input Capability	Total Capacity[a] (m^3)	Comment
Above-Grade Storage Facility [Text deleted.]	Solid LLW	4,510	Above ground storage of low-level until Low-Level Waste Disposal Facility.
Building 9404-7 (PCB Drum Storage Facility)	Solid PCB and uranium contaminated waste	40	Storage of liquid and/or hazardous waste not permitted except for PCB waste. Capacity for 496 drums.
Building 9206, Container Storage Area	Liquid/solid LLW and Mixed LLW	15	RCRA Part B permit. Storage for solid waste is 13 m^3. RCRA permit issued September 28, 1995.
Building 9212, Container Storage Area	Liquid/solid LLW and mixed LLW	15	RCRA Part B permit. Storage for solid waste is 9 m^3. RCRA permit issued September 28, 1995.
Building 9720-25S	Liquid/solid LLW and mixed LLW	334	This is a new facility that previously stored classified waste only. RCRA permit issued September 28, 1995.
Classified Waste Storage Facility (Building 9720-25)	Solid LLW and mixed LLW waste	495	RCRA Part B permit issued September 28, 1995.
Container Storage Facility (Building 9720-12)	Solid mixed LLW	105	RCRA Part B permit issued September 28, 1995. Design capacity is 123 m^3. Also contains hazardous and nonhazardous classified waste.
Containerized Waste Storage Area	Liquid/solid LLW and mixed LLW	632	Three concrete pads. RCRA Part B permit issued September 28, 1995.
Contaminated Scrap Metal Storage Yard	Solid LLW (uranium-contaminated scrap)	4,740	
Cyanide Treatment Facility	Cyanide spent plating batches, mixed LLW	8	RCRA Part B permit issued September 28, 1995. Also treatment facility for hazardous and mixed wastes.
Disposal Area Remedial Actions Solid Storage Facility	Solid mixed LLW	5,060	RCRA interim status. Facility full as of August 1994. Currently within the Environmental Restoration Program.
Depleted Uranium Storage Vaults I and II (9825-A and B oxide vault)	Solid LLW (depleted uranium oxide and metal)	1,020	Two vaults of reinforced concrete.
East Chestnut Ridge Waste Pile	Solid mixed LLW (contaminated soil and spoil from closure of RCRA units)	901	RCRA Part B permit issued.
Liquid Organic Waste Solvent Storage Facility (Building 9720-45, OD-10)	Liquid and solid mixed LLW. Ignitable nonreactive and radioactive waste. Can also include hazardous waste	147	RCRA permit issued September 1, 1994. Consists of six storage tanks and a diked and covered storage area of approximately 186 m^3. An additional 40 m^3 of drum storage permitted.

Table E.2.5–2. Low-Level and Mixed Low-Level Waste Storage Facilities at Y–12 Plant—Continued

Waste Oil/Solvent Bulk Storage Facility	Input Capability	Total Capacity[a] (m^3)	Comment
[Text deleted.] Liquid Storage Facility (Building 9416-35)	Liquid hazardous and mixed LLW	416	RCRA permit-by-rule. Also a treatment unit. Provides temporary storage before treatment.
Oil Land Soils Containment Pond	Soil contaminated with PCBs and volatile organics	612	RCRA permit issued June 30, 1989.
PCB and RCRA Hazardous Drum Storage Facility, Building 9720-9 (western half)	PCB and RCRA hazardous waste	738	RCRA permit issued September 28, 1995. The practical capacity has decreased to 201 m^3 due to renovation currently taking place. Much of the inventory was moved to 9720-25S.
RCRA and PCB Container Storage Area (Building 9720-58)	Solid mixed LLW	580	RCRA permit issued September 28, 1995. Permitted RCRA waste materials. Hazardous waste section included in hazardous waste table.
RCRA Staging Area (Building 9720-31)	Liquid and solid mixed LLW and hazardous waste	170	RCRA permit issued September 28, 1995.
Sludge Basin	Solid LLW	2,720	
Solid Storage Facility	Solid mixed LLW and hazardous waste to include PCB-contaminated waste	3,100	RCRA permit application submitted June 1993. Contains waste pile contaminated with radioactivity. Facility is currently within the Environmental Restoration Program.
Southeast Switchgear Room, Building 9201-4 (Alpha-4)	Solid mixed LLW (Old shutdown process waste)	65	RCRA Part B storage permit issued September 28, 1995. Permitted storage capacity.
Waste Oil/Solvent Bulk & Storage Facility, Building 9811-1 (OD-7)	Liquid hazardous waste and mixed LLW (oils and solvents contaminated with uranium and PCBs)	568	RCRA permit issued September 28, 1995. Four 30,000-gal and three 10,000-gal tanks.
Waste Oil/Solvent Drum Storage Facility, Building 9811-1 (OD-8)	Liquid and solid hazardous waste, LLW and mixed LLW	402	RCRA permit issued September 28, 1995. Waste is eventually taken to OD-9 or OD-10.
Waste Oil/Solvent Storage Facility (Building 9811-8, OD-9)	Liquid mixed LLW (including PCBs) and hazardous waste	757	RCRA permit issued September 28, 1995. Site includes five storage tanks. Also includes 33 m^3 of storage for drums.
West End Tank Farm	Mixed LLW (sludge)	9480	Permit by rule.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.
[Text deleted.]
Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR LMES 1996a; OR MMES 1993f.

Table E.2.5–3. Mixed Low-Level Waste Inventory at Y–12 Plant

Waste Matrix	Number of Waste Streams	Inventory as of December 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Contact-Handled				
Aqueous liquids/slurries	3	40	3	123
Organic liquids	4	314	4	383
Homogeneous solids	7	6,520	6	1,300
Soils/gravel	6	6,420	3	7
Debris waste	11	147	11	120
Lab packs	2	<1	None	None
Special waste	7	11	4	5
Other	3	9	1	<1
Total	43	13,461	32	1,938

Source: DOE 1995gg.

Table E.2.5–4. Hazardous Waste Treatment Facilities at Y–12 Plant

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Plating Rinsewater Treatment Facility (Building 9623)	Cyanide destruction, pH adjustment, flow equalization, electrochemical precipitation,flocculation and clarification.	Liquid hazardous (plating rinsewater) and mixed LLW	Treated wastewater discharged through Central Pollution Control Facility NPDES outfall and solids to West Tank Farm	30,300	RCRA permit-by-rule. NPDES permit does not allow more than 114,000 l in 3 days. Processed 380 m^3 of hazardous waste by 1994.
Steam Plant Wastewater Facility	Chemical treatment followed by filtration.	Liquid industrial and hazardous wastes	Treated wastewater discharged through NPDES outfall	233,000	RCRA permit-to-rule, NPDES permit. Capacity based on maximum treatment in 1994.

Source: DOE 1994n; DOE 1995gg; OR LMES 1996a.

Table E.2.5–5. Hazardous Waste Storage Facilities at Y–12 Plant

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Building 9418-9	PCB-contaminated mineral oil	53	Below-grade, diked tank.
Oil Drum Storage Area (OD3)	PCB-contaminated oils	45	Site is closed except for tanker.
Oil Landfarm Soils Storage Facility	Solid hazardous waste contaminated with PCBs and volatile organics (excavated soil from the closure of the Oil Landfarm)	612	RCRA permit application submitted June 1993. No new wastes are being stored.
PCB and RCRA Hazardous Drum Storage Facility, Building 9720-9 (eastern half)	Liquid and solid PCB waste	751	RCRA permit issued September 28, 1995 and TSCA permit approved September 24, 1991. Part of building included in mixed waste storage table.
PCB and RCRA Container Storage Area, Building 9720-58	Solid hazardous waste and mixed LLW	223	Permitted PCB waste materials. Mixed waste included in mixed LLW table. RCRA permit issued September 28, 1995.
RCRA Storage and Staging Area (Building 9720-31)	Liquid and solid hazardous waste to include PCB-contaminated waste	170	RCRA permit issued September 28, 1995.
[Text deleted.]			

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR LMES 1996a.

Table E.2.5–6. Reactor-Irradiated Nuclear Material Inventory at Oak Ridge Reservation

Site	Facility	Type	Number and Form	Estimated Heavy Metal[a] (m^3)
Y–12 Plant	Building 9720-5	Space Nuclear Auxiliary Power-10 fuel	36 rods in Sodium Potassium	0.1
	Building 9720-5	Health Physics Research Reactor fuel	31 fuel pieces	3.5
	Building 9720-5	DOE Demonstration Reactor Fuel	Core assembly	0.04
ORNL	Building 3019	SRS production fuel	176 cans	2
	Building 3019	Hanford production fuel	42 cans	1.5
	Building 3019	Commercial fuel (Canada ConEd)	401 cans	20
	Building 4501	Commercial fuel[b]	40 sections	0.1
	Buildings 3525 and 7920, Dry Wells 7823A, 7827, and 7829	Research and commercial reactor fuel	Fuel samples and targets	6
	Bulk Shielding Reactor and Oak Ridge Research Reactor	Research reactor fuel	41 Bulk Shielding Reactor elements and 32 ORR elements (pool 80 percent full)	4
	Classified Burial Ground	Unknown	Unknown	Unknown
	High Flux Isotope Reactor	Research reactor fuel	43 assemblies (pool 40 percent full)	7
	Homogeneous Reactor Experiment wells	Research reactor fuel	135 gallons of Uranyl Sulphate[c]	8
	Molten Salt Reactor Experiment	Research reactor fuel	Lithium fluoride and beryllium difluoride salt mixture	4
	Solid Waste Storage Area 6	KEMA Suspension Test Reactor	1 Core Assembly	0.01
	Tower Shield Reactor No. II	Research reactor fuel	1 assembly (pool full)	0.1

[a] Based on conversion factor 52 kg/m^3 (DOE 1995kk).
[b] Fuel from H.B. Robinson, Monticello, Oconee-1, Quad City-1, and Dresden-1 commercial power reactors.
[c] Solution in seven holes.
Source: DOE 1993s; DOE 1994d; DOE 1995kk; OR LMES 1996a; OR MMES 1995c.

Table E.2.5–7. Transuranic and Mixed Transuranic Waste Inventory at Oak Ridge National Laboratory

Waste Matrix	Number of Waste Streams	Inventory as of December 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Contact-Handled				
Multiple alpha emitters	9	1,400	1	46
Remote-Handled				
Multiple alpha emitters	6	1,720	2	62
Total	15	3,120	3	108

Source: DOE 1995gg.

Table E.2.5–8. Transuranic and Mixed Transuranic Waste Storage Facilities at Oak Ridge National Laboratory

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
TRU Retrievable Drum Storage Facility (Building 7826)	Contact-handled solid mixed TRU waste	326	Interim Part A permit (included in Part B application). Mainly 55-gal drums. May contain lead. RCRA closure underway.
TRU Retrievable Drum Storage Facility (Building 7834)	Contact-handled solid mixed TRU waste	408	Interim Part A permit. Mainly 55-gal drums. May contain lead. RCRA closure underway.
TRU Retrievable Concrete Cask Storage Facility (Building 7842, SWSA-6)	Contact-handled solid mixed TRU waste	354	Interim Part A permit (included in Part B application).
TRU Concrete Cask Storage Facility (Building 7855)	Remote-handled solid mixed TRU waste	139	Interim Part A permit (included in Part B application).
TRU Retrievable Drum Storage Facility (SWSA-5N Trenches)	Remote-handled solid mixed TRU waste	717	Under CERCLA closure.
TRU Retrievable Concrete Cask Storage Facility (Building 7878)	Contact-handled solid mixed TRU waste	266	Interim Part A permit (included in Part B application).
TRU Retrievable Drum Storage Facility (Building 7879)	Contact-handled solid mixed TRU waste	306	Interim RCRA Part A permit (included on RCRA Part B application). Will store waste from Nuclear Fuel Services. Also serves as a staging facility for LLW.
TRU Retrieval Drum Storage Facility (Building 7934)	Contact-handled solid mixed TRU waste	99	Interim Part A permit. Also serves as a volume reduction facility.

Source: DOE 1994n; OR DOE 1995g; OR LMES 1996a.

Table E.2.5-9. Low-Level, Mixed Low-Level, and Transuranic Waste Treatment Facilities at Oak Ridge National Laboratory

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Waste Compactor Facility (Building 7831)	Compaction	Compactible solid LLW	Compacted solid LLW in B-25 3x3x4.6 m (4x4x6 ft) boxes to K-25	11,300	Design capacity
Liquid LLW Evaporation Facility (Building 2531)	Evaporation/drying	Liquid LLW and mixed LLW	Evaporator condensates to process waste treatment plant. Some evaporator bottoms are stored at Melton Valley Facility.	18	Normal operating capacity. Maximum capacity is 4,540 l/hr for 20 days per month.
Melton Valley LLW Immobilization Facility	Liquid Decantation Ion Exchange and Solidification	Liquid mixed LLW and nonhazardous liquid waste	Concrete block to storage	189	System is limited to 189,000 l (50,00 gal) per campaign.
Process Waste Treatment Plant (Building 3544)	Ion exchange, neutralization, clarification, and filter presses	Liquid LLW and mixed LLW	Solid LLW (filter cake) to storage at K-25. Wastewater is sent to Nonradiological Wastewater Treatment Plant.	265,000	Normal operating capacity. Design capacity is 390,000 m^3/yr.
TRU Processing Facility	Evaporation, microwave solidification, solid segregation and packaging	Solid remote-handled TRU	Drums and boxes	620	Planned facility. Remote-handling capability for packaging

Source: DOE 1994k; DOE 1994n; DOE 1995gg.

Table E.2.5–10. Low-Level, Mixed Low-Level, and Hazardous Waste Storage Facilities at Oak Ridge National Laboratory

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Buildings 7823B, 7823E, 7827, 7829, 7831C, 7878A, B7823C, B7823D	Solid LLW	903	No permit necessary
Buildings 7842A and 7856	Solid remote-handled LLW	949	No permit necessary
Bulk Contaminated Soil Facility (Building 7576)	Low-level contaminated soil	938	Planned and funded
Chemical Waste Storage Facility (Building 7653)	Liquid wastewater for treatment	26	RCRA Part B permit to be submitted. Used for storage of small quantities of lab chemicals and process chemical wastes.
Class L-III/IV Retrievable Storage Facilities	Class III and IV solid LLW	566	Planned and funded. RCRA Part B permit submitted March 30, 1992.
Clean Oil Storage Pad (Building 7651)	Liquid/solid hazardous wastes	27	RCRA permit. Storage pad used to store drums containing noncontaminated used oil.
Facility 7841	LLW (contaminated scrap metal)	1,020	No permit necessary
Hazardous Waste Storage Facility (Building 7652)	Liquid hazardous waste	57	RCRA Part B permit. Used for storage of bulk chemical waste.
Hazardous Waste (PCB) Storage Facility (Building 7507)	Liquid/solid PCB-contaminated materials	31	RCRA interim permit
Liquid LLW System	Liquid mixed LLW and LLW	3,230	Active portion has 1,970 m^3 of storage. Includes Melton Valley Storage Tanks, which have capacity of 1,510 m^3.
Long-Term Hazardous Waste Storage Facility (Building 7654)	Liquid/solid mixed LLW	62	Interim Part A (included in Part B application) submitted January 14, 1993.
Mixed Waste Drum Storage Pad (Building 7507W)	Solid and liquid mixed LLW	83	Interim Part B RCRA submitted May 21, 1992.
Scrap Metal Accumulations Area	Contaminated scrap metal	4,350	No permit necessary
Storage Facility-semi underground (Building 7823)	Liquid/solid mixed waste oils, solvents, and other process wastes	229	Interim Part A (included on Part B application)
Tank 7830A	Bulk mixed waste oils	19	Interim RCRA Part A (included in RCRA Part B application)

Source: DOE 1994n; OR DOE 1995g; OR LMES 1996a.

Table E.2.5–11. Low-Level Waste Disposal Facilities at Oak Ridge National Laboratory

Disposal Unit	Input Capability	Capacity (m^3)	Comment
Asbestos silos (SWSA-6)	Low-level contaminated asbestos	22	Unit accepts only Y–12 asbestos, if contaminated with other than uranium contamination, other than that no offsite waste accepted. Closed at end of 1993. Capacity is amount stored.
Biological trenches (SWSA-6)	Low-level contaminated biological waste	106	Landfill operation. Closed at end of 1993. Capacity is amount stored.
High range silos (SWSA-6)	Solid LLW (200 mrem/hr to 1 rem/hr)	23	Concrete silos inside diameter (15 ft x 8 ft). Closed at end of 1993. Capacity is amount stored.
Interim Waste Management Facility	Solid LLW B-25 boxes encased in concrete	3,590	Four Tumulus pads (18.2 x 27.4 m). Fifth under construction. Each pad provides 897 m^3 for disposal.
Low range silos (SWSA-6)	Solid LLW (<200 mrem/hr)	204	Concrete silos inside diameter (15 ft x 8 ft). Closed at end of 1993. Capacity is amount stored.

Source: DOE 1994n; OR LMES 1996a; OR MMES 1993d; OR MMES 1995c.

Table E.2.5–12. Mixed Low-Level Waste Inventory at Oak Ridge National Laboratory (Resource Conservation and Recovery Act- *and State-Regulated)*

Waste Matrix	Number of Waste Streams	Inventory as of December 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Contact-Handled				
Aqueous liquid/slurries	3	22	3	34
Organic liquids	4	61	3	62
Homogeneous solids	6	4	5	4
Soils/gravel	3	5	3	8
Debris waste	9	7	9	22
Labpacks	4	36	4	3
Special wastes	7	2	5	2
Others	3	39	3	33
Remote-Handled				
Aqueous liquid, alpha	2	2,780	1	532
Homogeneous, solid, alpha	1	42	None	None
Total	42	2,998	36	700

Source: DOE 1995gg.

Table E.2.5–13. Hazardous Waste Treatment Facilities at Oak Ridge National Laboratory

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity[a]	Comment
Acid Neutralization Facility	Neutralization	Blowdown and demineralizer regeneration from Steam Plant	Liquid effluent to Nonradiological Wastewater Treatment Plant	44,900	Volume treated in 1992. Design feedrate is 23 m^3/hr
Chemical Detonation Facility (Building 7667)	Open burning	Solid and liquid explosive wastes (lab pack flammables)	Residue (ash) to Sludge Fixation Facility for treatment	Campaign	RCRA interim permit submitted January 4, 1993.
Leaking Gas Cylinder Area	Venting of damaged and excess gas cylinders	Hazardous gas cylinders	Returned to vendors or disposed of at Y–12 Plant Sanitary Landfill II	Campaign	Remote site consisting of clear area.
Non-radiological Wastewater Treatment Plant (Building 3608)	Clarification, filtering, air stripper, absorption, neutralization, dewatering, and ion exchange	Liquid corrosive waste in storage	Dewatered waste, carbon, liquid discharge	745,000	Normal operating capacity. Design capacity is 1,510,000 m^3/yr.

[a] For those facilities already in use, this is a normal operating capacity; for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: DOE 1994n; DOE 1995gg; OR DOE 1994a; OR LMES 1996a.

Table E.2.5–14. Hazardous Waste Storage Facilities at Oak Ridge National Laboratory

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
Chemical Waste Storage Facility (Building 7653)	Solid explosives, lab pack chemicals, and waste reactive metals	15	RCRA interim permit Part A (included on Part B application). Can be used for mixed waste. Permitted storage is 70 55-gal drums.
Clean Oil Storage Pad (Building 7651)	Clean oil and oil contaminated material	27	RCRA interim permit. Part A (included on Part B application). Can be used for mixed wastes. Permitted storage is 128 55-gal drums.
Hazardous Waste Storage Facility (Building 7507)	Liquid /solid mixed LLW and hazardous waste	31	RCRA interim permit Part A (included on Part B application). Permitted storage is 150 55-gal drums.
Hazardous Waste Storage Facility (Building 7652)	Hazardous bulk liquids and solids	57	RCRA Part B permit. Can be used for mixed wastes. Permitted storage is 275 55-gal drums.

Source: DOE 1994n; OR LMES 1996a; OR MMES 1995c.

Table E.2.5–15. Low-Level, Mixed Low-Level, and Hazardous Waste Treatment Facilities at K–25 Site

Treatment Unit	Treatment Method(s)	Input Capability	Output Capability	Total Capacity (m^3/yr)	Comment
Central Neutralization Facility (K-1407H)	Clarification, thickening, and neutralization	Liquid LLW, mixed LLW, and hazardous waste	Liquid effluent through NPDES outfall and sludge to hazardous waste storage unit	221,000	NPDES permit. RCRA permit-by-rule. Permitted capacity. Normal operation capacity is 111,000 m^3/yr.
Liquid Pretreatment Facility	Neutralization precipitation, liquid separation and chemical oxidation/reduction	Liquid aqueous and organic mixed waste	Effluent to existing wastewater facilities or TSCA Incinerator	Planned	Batch processes
Sludge Fixation Facility (Building K-1419)	Screening solidification/stabilization, centrifuging, and neutralization	Mixed waste sludges and solids	Liquid effluent to Central Neutralization Facility. Solidified containers stored at Concrete Block Casting and Storage Yard (Building K-1417)	2.5 m^3/hr	Design feedrate. RCRA permit submitted May 1989. Facility on standby.
TSCA Incinerator (K-1435)	Blending, incineration (rotary kiln)	Liquid and solid, mixed LLW, LLW and mixed LLW contaminated with PCBs	Ash (solid mixed LLW and hazardous) to hazardous waste storage unit, waste storage unit-012, ash water and blowdown water (mixed LLW and hazardous) to Central Neutralization Facility, and sludge (solid mixed LLW) to Sludge Fixation Facility	1,860 (liquid only)	State air permit approved; State RCRA permit expires September 27, 1997 and TSCA permit expires March 20, 1992. Site given continued authority to operate on old TSCA permit. Normal operating capacity. Maximum capacity is 15,700 m^3/yr.
Wastewater Treatment Facility (K-1232)	Centrifugation, neutralization, and precipitation	Liquid mixed LLW	Leachate (liquid LLW) to central neutralization facility and sludge (solid mixed LLW) to sludge fixation facility	0.8 m^3/hr	RCRA permit submitted May 18, 1989. Design feedrate. Facility not currently being utilized.

Source: DOE 1994n; DOE 1995gg; OR DOE 1994a.

Table E.2.5–16. Low Level, Mixed Low-Level, and Hazardous Waste Storage Facilities at K–25 Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Buildings K-1232, K-306-2, K306-4	Mixed LLW and LLW	688	Permitted.
Buildings K-1417 and K-1419	Mixed waste (sludge)	27,100	Under RCRA closure. Pond Waste Management Project storage facility for pond waste sludge.
Combustible Liquid Storage Tanks (K-1202)	Liquid LLW, mixed LLW, and hazardous waste to include PCBs	108	RCRA permit expires September 1, 2002. Two bulk storage tanks.
Flammable Liquid Storage Unit (K-1420A)	Liquid mixed LLW, PCB waste, and hazardous waste	108	RCRA permit expires September 1, 2002. Two bulk storage tanks.
Hazardous Waste Storage Unit (K-311-1)	Solid, mixed LLW, and hazardous waste	456	RCRA permit expires September 1, 2002. Vault for radiogenic lead waste. [Text deleted.]
Hazardous Waste Storage Unit (K-310-1)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	445	RCRA permit expires September 1, 2002. RCRA sludges and ash from operation of K-1035 incinerator. [Text deleted.]
Hazardous Waste Storage Unit (Vault 2A)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	439	RCRA permit expires September 1, 2002. Practical capacity. [Text deleted.]
Hazardous Waste Storage Unit (K-309-3)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste	354	RCRA permit expires September 1, 2002. Has been used for RCRA, PCB, and mixed wastes from all sites at ORR. Includes contaminated scrap metal. [Text deleted.]
Hazardous Waste Storage Unit (K-301-1 Vault 4)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	430	RCRA permit expires September 1, 2002. Storage of laboratory waste acids, bases, and organics. [Text deleted.]
Hazardous Waste Storage Unit (K-301-1, Vault 4A)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	637	RCRA permit expires September 1, 2002. Waste consists of sludges and incinerator ash.
Hazardous Waste Storage Unit (K-301-2, Vault 4B)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	399	RCRA permit expires September 1, 2002. Waste consists primarily of photographic waste and incinerator ash. [Text deleted.]
Hazardous Waste Storage Unit (K-302-4)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	524	RCRA permit expires September 1, 2002. Storage of RCRA and mixed wastes from K-25 and Y-12. [Text deleted.]
Hazardous Waste Storage Unit (Vault 8A, K-302-5)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	683	RCRA permit expires September 1, 2002. Storage of hazardous wastes from K-25 and Y-12. [Text deleted.]
Hazardous Waste Storage Unit (K-302-5)	Liquid and solid LLW, mixed LLW, hazardous, and non-RCRA waste to include PCBs	513	RCRA permit expires September 1, 2002. Storage of RCRA and mixed wastes from K-25 and Y-12. [Text deleted.]

Table E.2.5–16. Low Level, Mixed Low-Level, and Hazardous Waste Storage Facilities at K–25 Site—Continued

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Hazardous Waste Storage Unit (K-303-1)	Liquid and solid mixed LLW mixed LLW hazardous and non-RCRA waste to include PCBs	592	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-303-2)	Liquid and solid mixed LLW mixed LLW, hazardous and non-RCRA waste to include PCBs	496	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (Vault 19A) - Building K-305-6)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA waste to include PCBs.	592	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-305-6)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	354	RCRA permit expires September 1, 2002.
Hazardous Waste Storage Unit (K-305-12)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA waste to include PCBs	439	RCRA permit expires September 1, 2002. [Text deleted.]
Hazardous Waste Storage Unit (K-306-1)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	102	RCRA permit expires September 1, 2002. Sludges generated during treatment of Y-12 wastewaters. [Text deleted.]
Hazardous Waste Storage Unit (Vault 23A)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	470	RCRA permit expires September 1, 2002. Sludge generated during treatment of Y–12 wastewaters at either K–1232 or Y–12 facilities. [Text deleted.]
Hazardous Waste Storage Unit (K-306-3)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	286	RCRA permit expires September 1, 2002. Storage of RCRA, PCB, and mixed wastes from K-25, Y-12, and ORNL. [Text deleted.]
Hazardous Waste Storage Unit (K-306-4, Vault)	Liquid and solid mixed LLW, mixed LLW hazardous and non-RCRA waste to include PCBs	399	RCRA permit expires September 1, 2002. Mixed waste.
Hazardous Waste Storage Unit (Vault 25A)	Liquid and solid mixed LLW, LLW, hazardous and non-RCRA, waste to include PCBs	1,030	RCRA permit expires September 1, 2002. 286 m^3 of mixed LLW can be stored. Awaiting state approval for use as a hazardous waste storage facility.
Hazardous Waste Storage Unit (K-1036-A)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	150	RCRA permit expires September 1, 2002. Used for solvents and waste oil storage. Oil may be contaminated. Maximum capacity 2,000 55-gal drums.

Table E.2.5–16. Low Level, Mixed Low-Level, and Hazardous Waste Storage Facilities at K–25 Site—Continued

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Hazardous Flammable Waste Storage Unit (K-711)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA waste to include PCBs	312	RCRA permit expires September 1, 2002. Waste oils and solvents generated at other DOE facilities. Maximum capacity of 1,800 55-gal drums [Text deleted.]
Hazardous Flammable Waste Storage Unit (K-1025C)	Liquid and solid LLW, mixed LLW, hazardous and non-RCRA wastes	9	RCRA permit expires September 1, 2002. No incompatibles. Used for out-of-date or off-specification laboratory chemicals—disposed through offsite commercial facilities.
Hazardous Waste Storage Unit (K-1302)	LLW, mixed LLW, hazardous, and non-RCRA compressed gas	3	RCRA permit expires September 1, 2002. Gases are commercial products that are to be discarded or treated.
K-31 WP (stabilized sludge storage)	Hazardous/mixed waste	8,000	RCRA permit expires July 1, 2023. Storage of solidified pond waste sludge from closure of K-1407B and -C ponds. [Text deleted.]
K-33 WP (stabilized raw sludge storage)	Mixed LLW	8,510	Permitted. Storage of solidified pond waste sludge from closure of K-1470B and -C ponds. Materials continue to be shipped offsite for disposal.
K-301-4, K–25 Building, one unnamed vault and Vault 5A	Hazardous/mixed waste	377	Permitted Part B.
K 303-3/vault 10A, 11A	Solid LLW and mixed LLW	544	Permitted. Contaminated scrap metal. [Text deleted.] Awaiting letter of approval from state before use as hazardous waste storage unit.
K-306-IT, Building K–25 (vault)	Liquid/solid mixed LLW	156	Permit not necessary.
K-310-3, vault in Building K–25	Hazardous/mixed waste	527	RCRA permit expires September 1, 2002. Formerly LLW storage unit. New facility. Awaiting letter of approval from State before use as a hazardous waste storage facility.
K-402-1, process vault and Vault 31X, Building K-27	Hazardous/mixed waste	765	RCRA permit expires September 2002. Formerly LLW storage unit. Awaiting letter of approval from State before use as a hazardous waste storage facility.
K-1065-A, -B, -C, -D, -E	Mixed waste/sludge	27,400	RCRA permit expires 2023. Pond Waste Management Project storage units for pond waste sludge. Capacity of K-1065-C includes 28 m^3 of solid LLW.
RCRA storage unit, Vault 3A	Liquid and solid LLW and hazardous wastes	326	RCRA final permit expires 2002. Will be used for RCRA and mixed wastes from K–25, Y–12, and ORNL. Currently, empty PCB-contaminated containers from K–25 and Y–12 being stored in vault.
TSCA Container and Tank Storage (K-1435)	Non-PCB contaminated flammable liquid and mixed low-level that is also PCB-contaminated	509	TSCA incinerator has three storage areas. The tank farm has 3 10,000-gal and 12 5,000-gal tanks for liquid only. Area B (TSCA waste) can store 352 55-gal drums and Area C (RCRA waste) can store 496 55-gal drums. RCRA Part B permit.

Table E.2.5-16. Low Level, Mixed Low-Level, and Hazardous Waste Storage Facilities at K-25 Site—Continued

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
TSCA Storage Unit (K-33)	Liquid and solid hazardous waste (PCB)	960	No permit required.
TSCA Storage Unit (K-726)	Liquid and solid non-RCRA, nonradioactive waste contaminated with PCBs	85	No permit required to store waste when covered under TSCA. Concrete block building - PCB waste. [Text deleted.]
TSCA Storage Unit (K-303-4)	Liquid and solid non-RCRA, nonradioactive waste contaminated with PCBs	583	No permit required.
Vault 5A, Building K–25	Solid hazardous/mixed LLW	535	Permitted. Awaiting letter of approval from state before use as a hazardous waste storage facility.
Vault 24A, Building K-306-4	Solid hazardous/mixed LLW	292	Permitted. New facility awaiting letter of approval from state before use as a hazardous waste storage facility.
Waste Oil/Hazardous Wastes Storage I (K-1425 containers)	Liquid and solid LLW and mixed LLW	85	Part B permit has been issued by the State for all storage units listed as of September 30, 1992. Wastes stored include oils, solvents, water, and organics. Maximum capacity 480 55-gal drums.
Waste Oil/Hazardous Wastes Storage II (K-1425 tanks)	Liquid LLW and mixed LLW	343	Part B permit has been issued by the State for units listed as of September 30, 1992. Wastes stored include oils, solvents, water, and organics. Four 22,500-gal tanks.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.
Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR LMES 1996a; ORR 1993a:11.

Table E.2.5–17. Low-Level Waste Storage Facilities at K–25 Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Contaminated Scrap Metal Yard (K-770)	Solid LLW (uranium-contaminated scrap metal, ferrous and nonferrous)	29,600	6.9 acres of contaminated scrap metal. Design capacity [Text deleted.] Responsibility for facility transferred to Environmental Restoration in 1994 and is no longer available for LLW storage.
K-33 LLW Container Facility	Liquid/solid LLW	1,410	No permit necessary.
K-1313A (Rubb Tents I and II)	Solid LLW	246	Permit not necessary. Used to store Y–12, ORNL, and K–25 LLW.
LLW Storage Unit (Vault 15A-Building K-25)	Solid LLW	564	RCRA interim status September 1, 1990. Awaiting letter of approval from State before use as a hazardous waste storage facility. Used for radioactively-contaminated waste from K–25, Y–12 and ORNL.
LLW Storage Unit (K-303-5)	Liquid and solid LLW	470	RCRA permit expires September 1, 2002. Construction upgrades required before storage of mixed waste. Used for radioactively-contaminated waste from K–25, Y–12 and ORNL.
LLW Storage Unit (K-306-2)	Solid LLW	246	Storage of radioactively-contaminated soil from Y–12. [Text deleted.]
LLW Storage Unit (K-306-7)	Liquid and solid LLW	314	Storage of radioactively-contaminated soil from Y–12. [Text deleted.]
LLW Storage Unit (K-309-2)	Liquid and solid LLW, non-RCRA, and nonradioactive (soils and metals)	663	Used for radioactively-contaminated waste from K–25.
LLW Storage Unit (K-310-2)	Liquid and solid LLW	654	Used for radioactively-contaminated waste generated at ORNL.
LLW Storage Unit, (K-1066-H)	Solid LLW (containerized)	4,730	Outdoor storage area.
Vault 6 (K–25 building)	Solid LLW	272	No permit necessary.

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: DOE 1994n; OR DOE 1993a; OR DOE 1995g; OR LMES 1996a.

Table E.2.5–18. Mixed Low-Level Waste Inventory at K–25 Site

Waste Matrix	Number of Waste Streams	Inventory as of December 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Contact-Handled				
Aqueous liquids	5	442	5	169
Organic liquids	5	348	4	118
Homogeneous solids	15	27,800	8	1,380
Soils/gravel	4	272	3	49
Debris waste	12	386	12	317
Labpacks	2	22	2	5
Special wastes	7	117	4	10
Other	3	66	1	1
Total	53	29,453	39	2,049

Source: DOE 1995gg.

E.2.6 SAVANNAH RIVER SITE

The process of manufacturing useful nuclear materials has produced radioactive, mixed, and hazardous wastes that are treated, stored, or disposed of at the SRS. The *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE/EIS-0217) addresses the tasks to be completed in the next 10 years to clean up existing waste units and bring current operations into compliance with applicable regulations. It deals in detail with the current conditions and provides the preferred alternatives for processing current and future waste streams. It also addresses the development and funding of processes to minimize waste generation and to safely process and dispose of future waste generation.

Pollution Prevention. Pollution prevention, previously driven by best management practices and economics, is now mandated by statutes, regulations, and agency directives. The SRS Waste Minimization and Pollution Prevention Program is designed to achieve continuous reduction of wastes and pollutant releases to the maximum extent feasible and in accord with regulatory requirements while fulfilling national security missions. The *SRS Waste Minimization and Pollution Prevention Awareness Plan* addresses wastes and potential pollutants of all types and establishes priorities for accomplishing waste minimization and pollution prevention through source reduction, recycling, treatment, and environmentally safe disposal.

Spent Nuclear Fuel. [Text deleted.] DOE will make detailed decisions for SRS concerning the treatment and stabilization of its current and future inventory of spent nuclear fuel after the completion of site-specific analysis pursuant to NEPA. SRS has been one of the receiving sites for returned domestic and foreign research reactor spent fuel, and will manage all of DOE's aluminum-clad spent fuel. The stabilization and storage of spent nuclear fuel at SRS has been addressed programmatically in the ROD (60 FR 28680), as amended (61 FR 9441), for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (Spent Nuclear Fuel EIS) (DOE/EIS-0203-F) and the ROD (61 FR 25092) for the *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (DOE/EIS-0218F). There are about 206 t (227 tons) of spent reactor fuel in storage at SRS (60 FR 28680). As a result of the ROD from the programmatic Spent Nuclear Fuel EIS, SRS will increase its inventory of aluminum-clad spent nuclear fuel to 213 t (234 tons). As a result of the *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel*, SRS will receive an additional 18.2 t (20.1 tons) of research reactor spent fuel and 0.6 t (0.7 tons) of target material.

High-Level Waste. Liquid HLW containing actinides and hazardous chemicals were generated from recovery and purification of TRU products and from spent fuel processing. These wastes were retreivably stored in 51 underground tanks. One of these tanks is out of service. The tanks are managed in compliance with Federal laws, State of South Carolina regulations, and DOE Orders. The waste is segregated by heat generation rate, neutralized to excess alkalinity, and stored to permit the decay of short-lived radionuclides before its volume is reduced by evaporation. Twenty-nine of the tanks are located in the H-Area Tank Farm, and 22 are located in the F-Area Tank Farm. The tanks are of four different designs, but all are of carbon steel. Wastes are transferred to and processed in the newer tanks, which have full-height secondary containment and forced-water cooling. Some older tanks contain old salt and sludge awaiting waste removal. Other old tanks have had waste removed, except for residue, and are used to store low-activity waste. The older tanks will be taken out of service when the contents of other tanks are transferred to the Defense Waste Processing Facility (DWPF).

High-heat liquid waste is stored for 1 to 2 years to allow decay of radionuclides before being processed through evaporators. Low-heat waste is sent directly to the evaporator feed tanks. Each tank farm has one evaporator that is used to reduce water volume and concentrate the solids. A replacement higher-capacity evaporator is planned and may be used in conjunction with the current evaporators. Liquids can be reduced to 25 to 33 percent of original volume and stored as salts or sludges. Cesium removal columns can operate in conjunction with the evaporators. The evaporators obtain decontamination factors of 10,000 to 100,000, and the cesium removal columns can obtain another 10 to 200 decontamination factors. Decontaminated liquids (overheads) are sent to the ETF for processing before being released to Upper Three Runs Creek. The concentrated salt solution is processed to remove radionuclides, and the decontaminated solution is sent to the DWPF Saltstone Facility for solidification and storage in the saltstone vaults.

The remaining sludges and salts contain the majority of the radionuclides, and are stored separately, awaiting vitrification. Prior to vitrification, salt is precipitated in the in-tank precipitation process. The precipitate and sludge is fed into the vitrification process in the DWPF. The waste is mixed with borosilicate glass and immobilized by melting the mixture, then pouring it into stainless steel cylinders. These cylinders are stored in a shielded facility at the DWPF until a repository is available. Figure E.2.6–1 illustrates HLW management at SRS. Tables E.2.6–1, E.2.6–2, and E.2.6–3 list HLW inventories, treatment, and storage facilities at SRS.

Transuranic Waste. All TRU waste currently being generated is stored in containers on aboveground storage pads in compliance with state regulations and DOE Orders. Older TRU wastes (prior to 1965) were buried in plastic bags and cardboard boxes in earthen trenches. Wastes containing more than 0.1 Curies (Ci) per package were placed in concrete containers and buried. Wastes containing less than 0.1 Ci per package were buried unencapsulated in earthen trenches. Since 1974, TRU wastes containing more than 10 nCi/g have been stored in retrievable containers free of external contamination. Polyethylene-lined galvanized drums containing more than 0.5 Ci are additionally protected by closure in concrete culverts.

Approximately 85 percent of the TRU waste currently in storage is suspected of being contaminated with hazardous constituents. Presently, waste is characterized by onsite generators and is being stored prior to final disposal. TRU waste containing less than 100 nCi/g may be disposed of as LLW at SRS. Waste containing greater than 100 nCi/g, and meeting the final WIPP waste acceptance criteria, will be sent to WIPP, if WIPP is determined to be a suitable repository pursuant to the requirements of 40 CFR 191 and 40 CFR 268. Waste not meeting the acceptance criteria as currently packaged will be repackaged as necessary to meet the WIPP waste acceptance criteria. Should additional treatment be necessary for disposal at WIPP, SRS would develop the appropriate treatment technology, or ship this waste to another facility for treatment. Studies are under way to solve the problem of high-heat TRU waste, which is unique to SRS. Wastes with high Pu-238 fractions generate too much heat to be shipped in the TRUPACT-II. TRU waste is currently stored on 17 pads at the solid waste disposal facility in the E-Area. Figure E.2.6–2 illustrates the TRU waste management plan. Table E.2.6–4 lists the mixed TRU waste inventories, and Tables E.2.6–5 and E.2.6–6 list the TRU and mixed TRU waste treatment and storage facilities.

Low-Level Waste. Both liquid and solid LLW are treated at SRS. Liquids are managed and processed to remove and solidify the radioactive constituents and to release the balance of the liquids to permitted discharge points in compliance with state regulations. The bulk of liquid LLW is process wastewater consisting of effluent cooling water, purge water from storage basins for irradiated reactor fuel or target elements, distillate from the evaporation of process waste streams, and surface water runoff from areas where there is a potential for radioactive contamination.

Aqueous LLW streams are sent to the ETF and treated by filtration, reverse osmosis, and ion exchange to remove the radionuclide contaminants. After treatment, the effluent is discharged to Upper Three Runs Creek. The resultant wastes are concentrated by evaporation and stored in the H-Area tank farm for eventual treatment in the DWPF Saltstone Facility. In that facility, they will be processed with grout for onsite disposal. Figure E.2.6–3 illustrates the LLW processing at SRS. Treatment and storage facilities for LLW are listed in Tables E.2.6–7 and E.2.6–8.

Disposal of solid LLW at the SRS traditionally has been accomplished using engineered trenches in accordance with the guidelines and technology existing at the time of disposal. Currently, packaged LLW is deposited in the E-area vaults. These are concrete structures that meet the requirements of DOE Orders, incorporate technological advances, and address more stringent Federal regulation and heightened environmental awareness. Four basic types of vaults/buildings are used for the different waste categories: low-activity waste vault, intermediate-level nontritium vault, intermediate-level tritium vault, and long-lived waste storage building.

The vaults are below-grade concrete structures and the storage building is a metal building on a concrete pad. Long-lived waste is being stored until a final disposition can be determined. Additional information on these facilities is given in Table E.2.6–9.

Solid LLW is segregated into several categories to facilitate proper treatment, storage, and disposal. Solid LLW that radiates less than 200 thousandths of one roentgen equivalent man (rem), also called 200 mrem, per hour at 5 cm from the unshielded container is considered low-activity waste. If it radiates greater than 200 mrem/hr at 5 cm, it is considered intermediate-activity waste. This waste is typically contaminated equipment from separations, reactors, or waste management facilities. Intermediate activity tritium waste is intermediate-activity waste with more than 10 Ci of tritium per container. Residuals from tritium operations equipment are included in this waste. Long-lived waste is contaminated with long-lived isotopes that exceed the waste acceptance criteria for disposal. Resin contaminated with carbon-14 from reactor operations is an example. Excavated soil from radiological materials areas that is potentially contaminated, and cannot be economically demonstrated to be uncontaminated, is managed as suspect soil. Solid LLW typically consists of protective clothing, contaminated equipment, irradiated hardware, residuals from tritium extraction operations, and spent deionizer resins. All LLW is disposed of in the solid waste disposal facility in the E-Area between the F- and H-Areas. Wastes are compacted and packaged for burial. Monitoring wells are located near each disposed waste area to verify performance and to monitor groundwater in the vicinity of the vaults. As of December 1994, the total inventory of LLW disposed of at SRS was 676,400 m^3 (884,700 yd^3) (DOE 1995kk).

Mixed Low-Level Waste. Management of mixed wastes includes safe storage until treatment is available. Mixed LLW is stored in the A-, E-, M-, N-, and S- Areas in various tanks and buildings. These facilities include burial-ground solvent tanks, the M-Area Process Waste Interim Treatment/Storage Facility, the Savannah River Technology Center mixed waste storage tanks, and the organic waste storage tanks. These South Carolina Department of Health and Environmental Control-permitted facilities will remain in use until appropriate treatment and disposal is performed on the waste.

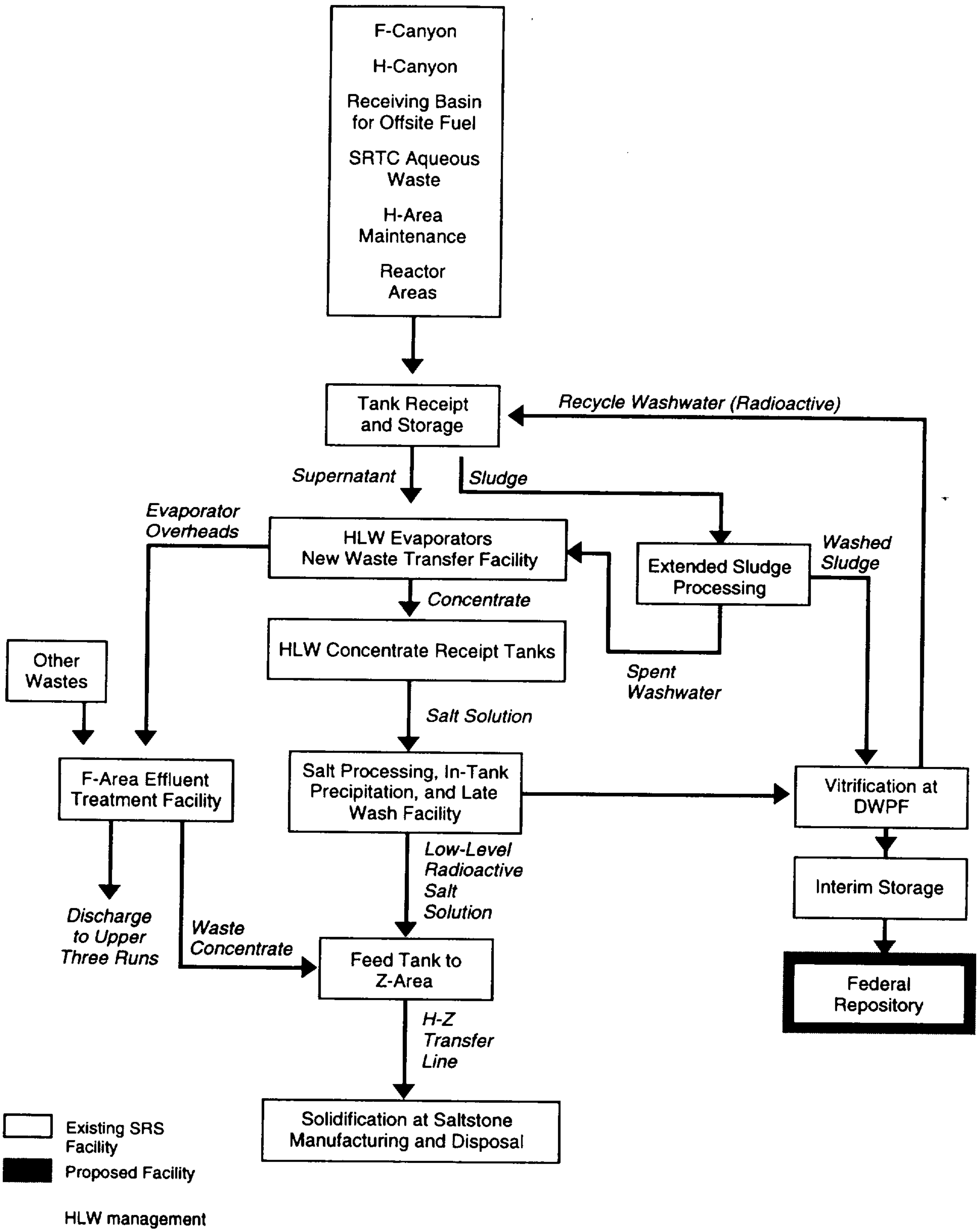
The Hazardous/Mixed Waste Treatment and Disposal Facility and the Consolidated Incineration Facility will process both mixed and hazardous wastes. The mixed waste management plan for SRS, illustrated in Figure E.2.6–4, has been reevaluated through the development of a site treatment plan in accordance with the *Federal Facility Compliance Act*. Mixed waste inventories are listed in Table E.2.6–10. Treatment facilities and processes are listed in Table E.2.6–7. Storage facilities capacity and status are listed in Table E.2.6–8.

Hazardous Waste. Typical hazardous wastes at SRS are lead, mercury, cadmium, 1,1,1-trichloroethane, leaded oil, trichlorotrifluoroethane, benzene, and paint solvents. Figure E.2.6–5 illustrates hazardous wastes management at SRS. Table E.2.6–11 lists hazardous waste storage facilities at SRS.

This waste is stored in RCRA-permitted buildings in the B- and N-Areas. Although hazardous waste was previously sent offsite for treatment and disposal, DOE imposed a moratorium on shipments of hazardous materials from radiological areas. Now, waste that is confirmed as not subject to the moratorium is shipped to an offsite vendor for processing and disposal. SRS annually publishes the tier two emergency and hazardous chemical inventory report, which lists hazardous chemicals that are present above their minimum threshold level or are extremely hazardous substances under the emergency planning community *Right-to-Know Act of 1986*. The annual reports filed under the *Superfund Amendments and Reauthorization Act for the SRS* facilities include year-to-year inventories of these chemicals.

Nonhazardous Waste. SRS-generated municipal solid waste is currently being sent to a permitted offsite disposal facility. DOE is evaluating a proposal to participate in an interagency effort to establish a regional solid waste management center at SRS (DOE/EA-0989, DOE/EA-1079). SRS disposes of other nonhazardous wastes consisting of scrap metal, powerhouse ash, domestic sewage, scrap wood, construction debris, and used railroad ties, in a variety of ways.

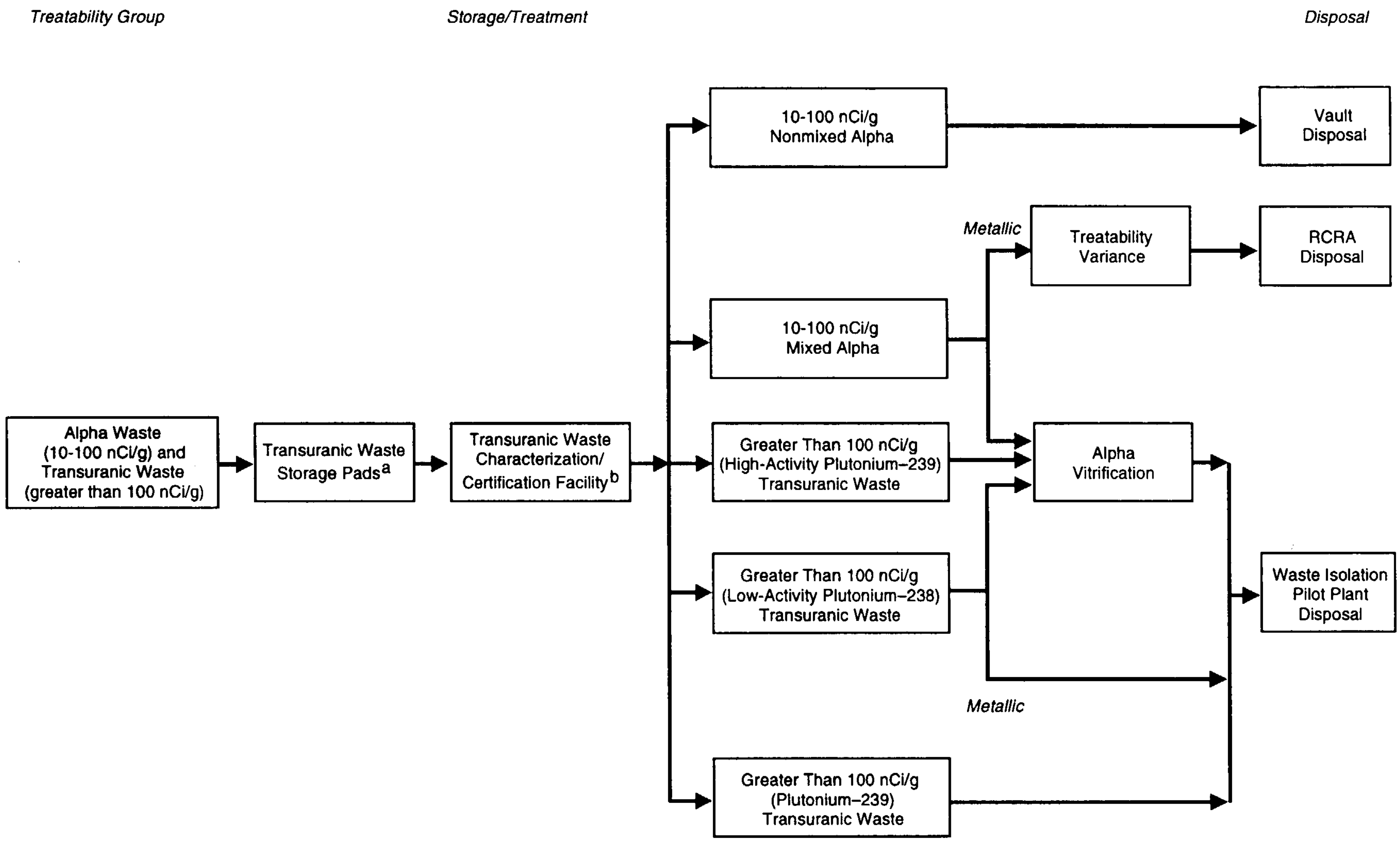
Scrap metal is sold to salvage vendors for reclamation. Powerhouse ash and domestic sewage sludge is used for land reclamation. Scrap wood is burned onsite or chipped for mulch. Construction debris is used for erosion control. Railroad ties are shipped offsite for disposal. Nonhazardous waste management is illustrated in Figure E.2.6–6.



Note: SRTC=Savannah River Technology Center
Source: SR DOE 1995b.

2705/FMD

Figure E.2.6–1. High-Level Waste Management at Savannah River Site.



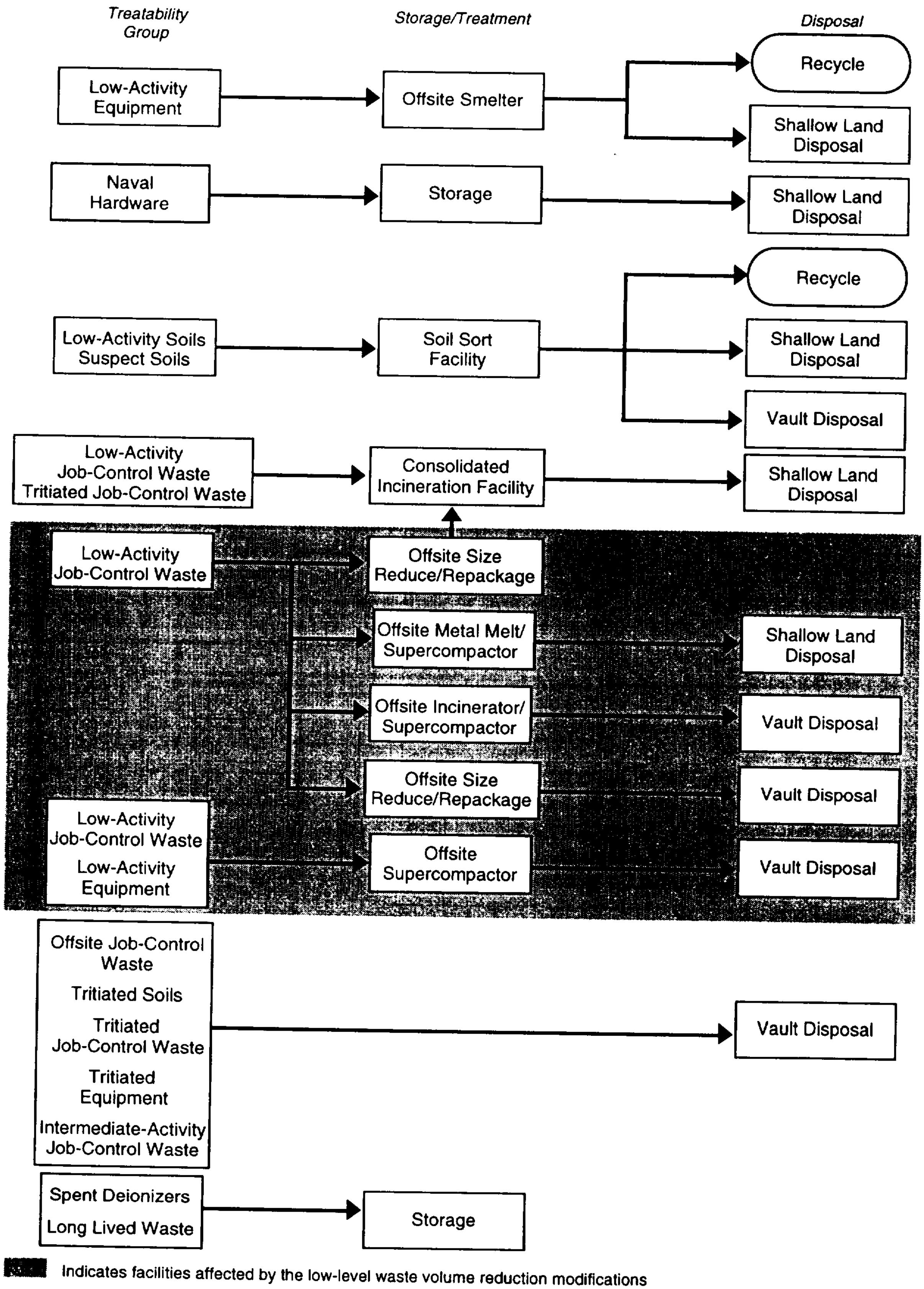
[a] Alternate storage locations are being evaluated; this analysis is based on using transuranic waste storage pads only.

[b] Waste certification activities consolidated with characterization/certification facility.

Source: SR DOE 1995b.

2806/FMD

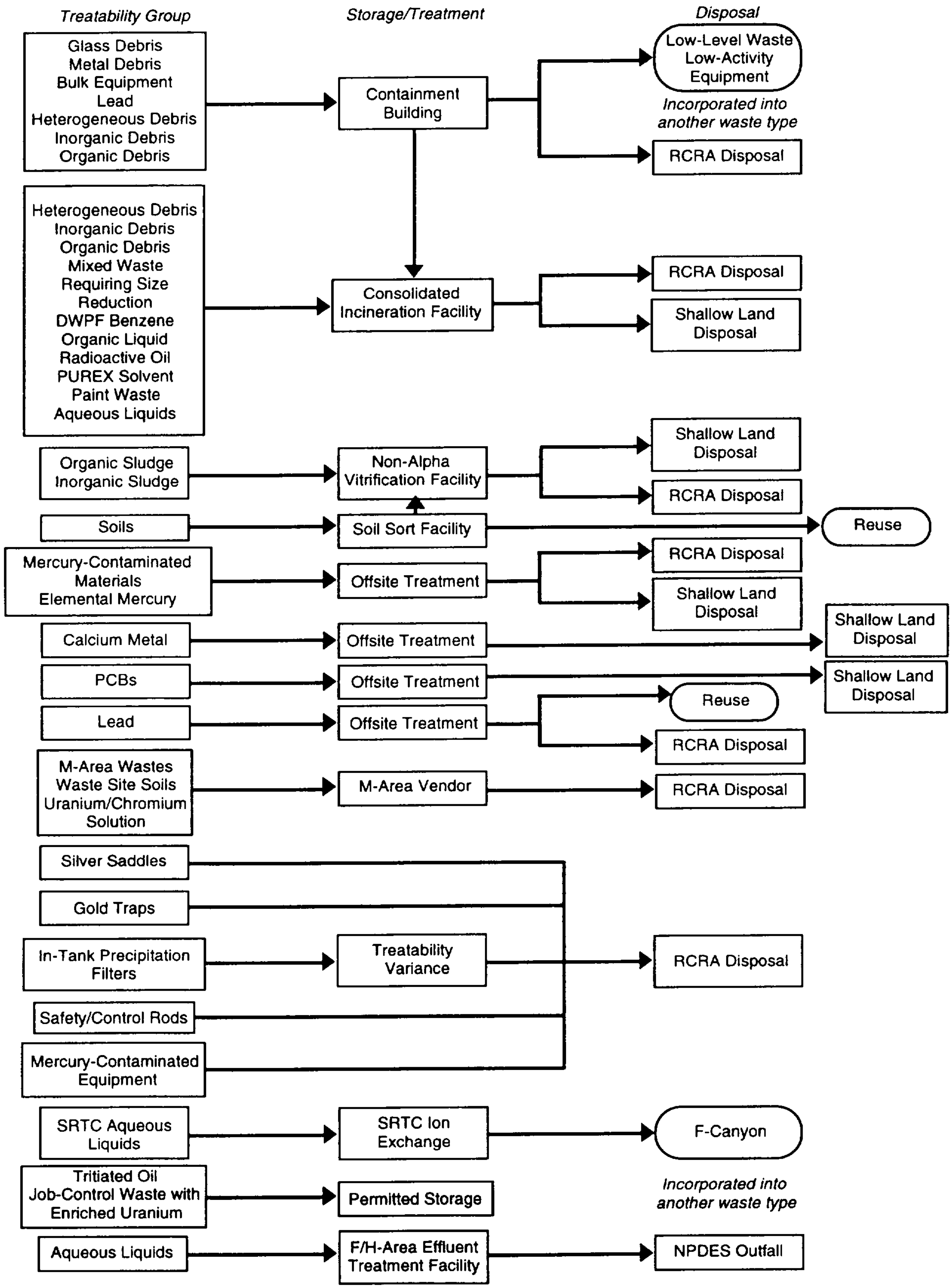
Figure E.2.6–2. Transuranic Waste Management at Savannah River Site.



Source: SR DOE 1995b.

Figure E.2.6–3. Low-Level Waste Management at Savannah River Site.

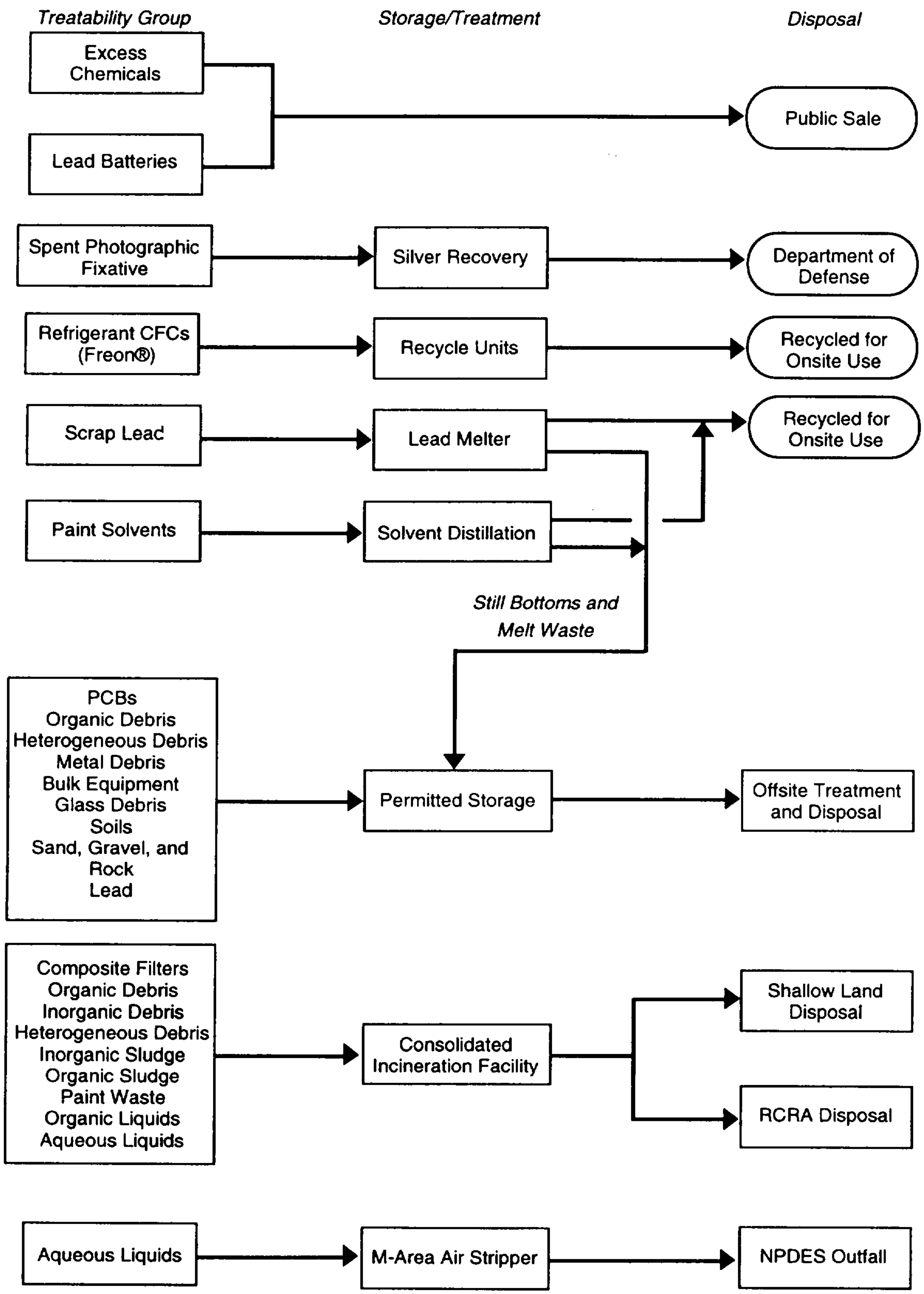
2807/S&D



Note: SRTC=Savannah River Technology Center
Source: SR DOE 1995b.

2808/S&D

Figure E.2.6–4. Mixed Waste Management at Savannah River Site.



Source: SR DOE 1995b.

2809/FMD

Figure E.2.6–5. Hazardous Waste Management at Savannah River Site.

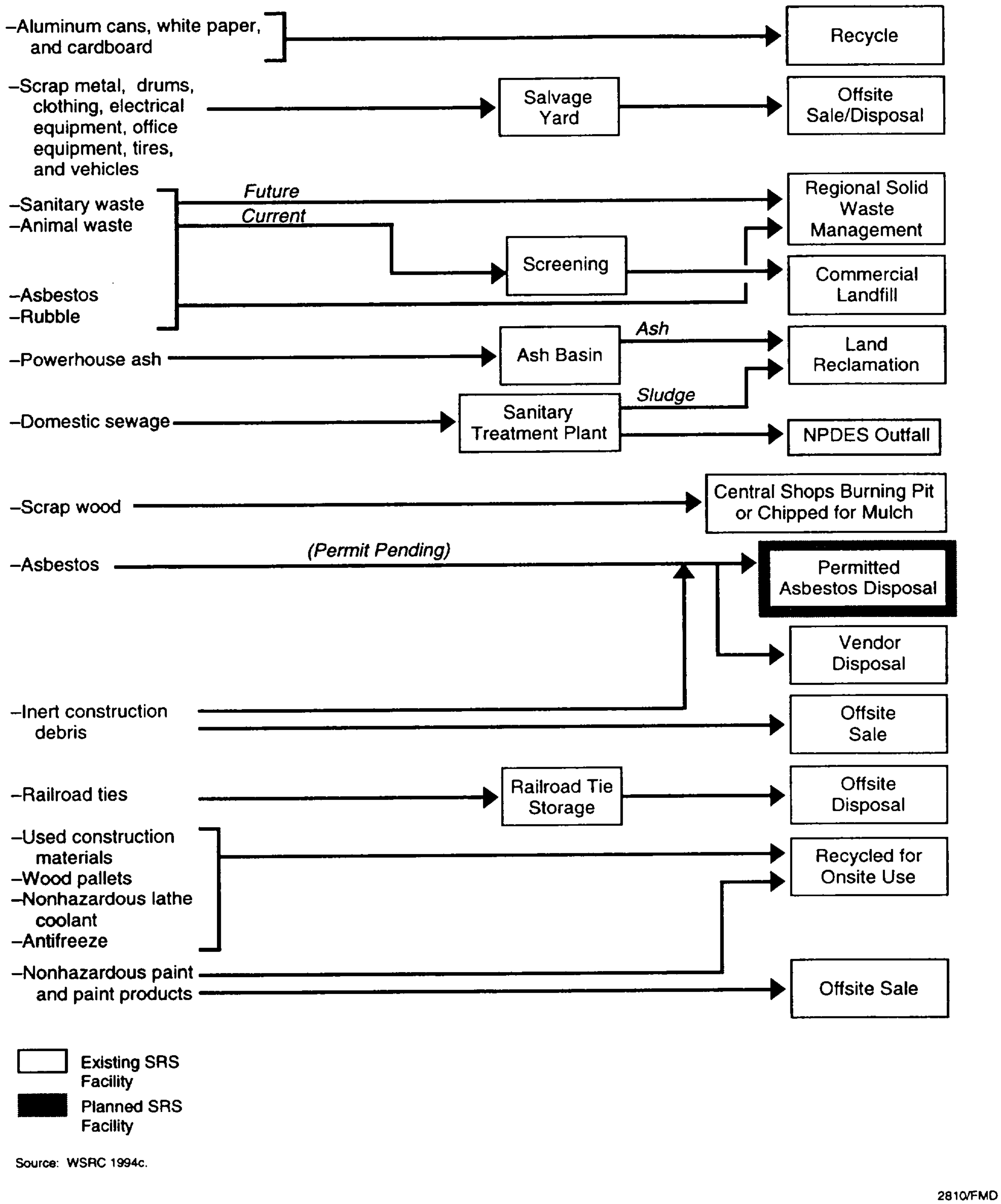


Figure E.2.6–6. Nonhazardous Waste Management at Savannah River Site.

Table E.2.6–1. High-Level Waste Inventory at Savannah River Site

Waste Matrix	Number of Waste Streams	Inventory as of September 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Remote-Handled				
Aqueous liquids, slurries	2	127,040	2	15,430
[Text deleted.]				

Source: DOE 1995gg; WSRC 1995a.

Table E.2.6–2. High-Level Waste Treatment Facilities at Savannah River Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
F- and H-Tank Farms	Neutralization dissolution, chemical reaction	HLW aqueous liquid solutions and slurries	HLW aqueous liquid, sludge, solutions	[b]	Operational
Savannah River Technology Center high activity treatment probe	Ion exchange	HLW aqueous liquid	Mixed LLW liquid, HLW sludge	1,725	Operational
F- and H-Evaporators	Evaporation, ion exchange (cesium removal)	HLW aqueous liquid	HLW sludge, salt, slurry, organic solid	26,900[c]	Operational
Replacement Evaporator	Evaporation, ion exchange (cesium removal)	HLW aqueous liquid	HLW sludge, salt, slurry, organic solid	13,800	Design and construction phase planned for 1999
DWPF	Vitrification	HLW slurry and precipitate	HLW borosilicate	18,800	Operational
Extended Sludge Processing	Soil washing to remove soluble salts, precipitation	HLW sludge	HLW sludge	834	Operational
In-Tank Precipitation	Soil washing to remove soluble salts, precipitation	HLW salt solution	LLW salt solution, HLW precipitate slurry	Would produce 22,700 m^3 salt solution and 1,900 m^3 precipitate	Operational
Late wash	Washing to remove sodium nitrate	HLW precipitate slurry	HLW precipitate	24,600	Undergoing design and construction

[a] For those facilities already in use, this is a normal operating capacity, whereas for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies and permit issuance.

[b] Batch process; depends on available tanks and process used.

[c] Based on net tank space gained. Input volume.

Source: SR DOE 1994b; SR DOE 1995c; WSRC 1995a; WSRC 1995b.

Table E.2.6–3. High-Level Waste Storage Facilities at Savannah River Site

Storage Unit	Input Capability	Total Capacity[a]	Comment
F- and H-Area Tank Farms[b]	HLW, corrosive, toxic aqueous liquids, salt, sludge	145,000 m^3	Operational
DWPF Vitrification Plant, glass waste storage buildings	HLW solid borosilicate glass in stainless steel cylinders	4,572 canisters (7.6 t glass)	First unit available, second unit planned and approved.
DWPF Vitrification Plant, failed equipment storage	Failed melters	3,720 m^3	

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

[b] Tanks that do not meet secondary containment criteria as described in the FFCA are not included.

Source: SR DOE 1994b; SR DOE 1995c.

Table E.2.6–4. Transuranic and Mixed Transuranic Waste Inventory at Savannah River Site

Waste Matrix	Number of Waste Streams	Inventory as of September 30, 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Contact-Handled				
Organic liquids	1	<1	0	0
Combustible debris	3	7,693	1	240
Debris	2	199	2	2,613
Ash	1	<1	0	0
Total	5	7,892	3	2,853

Source: DOE 1995gg; WSRC 1995a.

Table E.2.6–5. Transuranic and Mixed Transuranic Waste Treatment Facilities at Savannah River Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a]	Comment
TRU Waste Characterization/ Certification Facility	Assaying, sorting, decontamination, size reduction, welding, venting, encapsulation	Mixed and non-mixed TRU wastes	Certified forms for disposal	1,720 m^3/yr	Begin operations in 2007
Alpha Vitrification	Vitrification	TRU, Mixed-TRU waste	Certified and stabilized forms for disposal.	559 m^3/yr liquid or 2,280 m^3/yr solid	Planned

[a] For facilities under design or construction this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: SR DOE 1995c; WSRC 1995a; WSRC 1995b.

Table E.2.6–6. Transuranic and Mixed Transuranic Waste Storage Facilities at Savannah River Site

Storage Unit	Input Capability	Total Capacity (m^3)	Comment
TRU Storage Pads	Miscellaneous solid TRU waste, extraction procedure toxic waste, listed waste	34,400	Operational RCRA Part A. No offsite waste planned. Buried waste to be exhumed, processed at TRU Waste Facility, and shipped to WIPP. Nineteen pads in use, 10 additional pads planned.

Source: SR DOE 1995c; WSRC 1995a.

Table E.2.6–7. Low-Level and Mixed Low-Level Waste Treatment Facilities at Savannah River Site

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Consolidated Incineration Facility and Ashcrete Stabilization Facility	Incineration/Stabilization	LLW, mixed LLW, liquid, solid, ash, slurry	Stabilized LLW, mixed LLW, solid	4,630 (liquids) 17,830 (solids)	Planned, approved, RCRA final, available 1996
F- and H-Areas ETF	Neutralization, chemical precipitation, filtration, carbon adsorption, reverse osmosis, ion exchange, evaporation, mercury adsorption	Mixed LLW, aqueous liquids (F- & H- Area wastewater, evaporator overheads and condensate, cesium removal column effluent)	Corrosive LLW liquid concentrate, treated water effluent; used activated carbon, used ion exchange resins (solid LLW)	1,930,000	Operational, NPDES: Operating
M-, L-, and H-Area Compactors	Compaction	Solid LLW job waste	Compacted LLW	3,983	Operational
Hazardous/Mixed Waste Containment Building	Physical and Chemical decontamination, Wet chemical oxidation, encapsulation, amalgamation	Liquids and solids, mixed LLW, toxic, corrosive, reactive, metal, sludge, debris	Containment Facility	703	Planned, approved, begin operation in 2006
LLW Smelter	Off-site decontamination	LLW, equipment	Recovered metal	600	Offsite facility
Non-Alpha Vitrification Facility	Sorting, vitrification	LLW, mixed LLW, hazardous wastes	Mixed LLW	3,090	Proposed facility
Offsite Mixed Waste Treatments	Amalgamation, PCB destruction, acid bath, smelting	Mixed LLW	Solid LLW	124	Offsite facilities
M-Area Liquid ETF	Filtration, flocculation neutralization, precipitation	Liquid mixed LLW	Wastewater, solid mixed LLW, sludge	999,000	Operational, NPDES: operating
M-Area Vendor Treatment Facility	Vitrification	Aqueous liquids and slurries, mixed LLW, sludges	Wastewater, solid mixed LLW, borosilicate glass	2,470	Planned, approved, contract awarded for construction, NPDES

Table E.2.6–7. Low-Level and Mixed Low-Level Waste Treatment Facilities at Savannah River Site—Continued

Treatment Unit	Treatment Method	Input Capability	Output Capability	Total Capacity[a] (m^3/yr)	Comment
Savannah River Technology Center Ion Exchange Treatment Probe Low Activity	Ion exchange	Mixed LLW, aqueous liquids	Aqueous liquid, solid, mixed LLW	11,200	Operational, RCRA: interim
Soil Sort Facility	Sorting, separating contaminated soils	LLW soil	Low-level contaminated and uncontaminated soil	2,540	Proposed facility
Supercompactor, offsite	Compaction	Solid LLW	Compacted solid LLW	42,400	Commercial facilities
Supercompactor, onsite	Compaction	Solid LLW	Compacted solid LLW	5,700	Proposed facility
Z-Area Saltstone Facility	Stabilization (solidification with radionuclide binders)	Liquids, mixed LLW, sludges, toxic, corrosive	Solid LLW, nonhazardous	28,400	Operational, permitted disposal, CWA, RCRA: final

[a] For those facilities already in use, this is a normal operating capacity, whereas for facilities under design or construction, this is a design capacity. Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds, results of treatability studies, and permit issuance.

Source: SR DOE 1995c; WSRC 1995a.

Table E.2.6–8. Low-Level and Mixed Low-Level Waste Storage Facilities at Savannah River Site

Storage Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Burial Ground Solvent Tanks (S23-30)	Liquid mixed LLW	727	To be closed, RCRA Part A
DWPF Organic Waste Storage Tank (430-S)	Liquid mixed LLW, ignitable, toxic	568	Operational, RCRA Part A
Liquid Waste Solvent Tanks (S33-36)	Liquid mixed LLW	454	Planned facility
M-Area Process Waste Interim Treatment/Storage Facility	Liquid mixed LLW, listed, (electroplate sludge)	8,300	Operational, RCRA Part A
Mixed Waste Storage Buildings (643-29E and 643-43E)	Liquid mixed LLW solid, toxic, listed, ignitable, metal, sludge, soil	1,300	Operational, RCRA Part A
Mixed Waste Storage Shed (316-M)	Liquid and solid mixed LLW	120	Operational, RCRA Part A
Savannah River Laboratory High Activity Storage Tanks (772-2A)	Liquid mixed LLW, toxic, Toxicity Characteristic Leaching Procedure	198	Operational, RCRA Part A
Hazardous Waste Storage Facility (645-2N)	Mixed LLW	580	Operational, RCRA Part B
Process Waste Interim Treatment	Liquid mixed LLW	8,300	Operational, RCRA Part A
Long-lived Waste Storage Buildings	Process water deionizers containing carbon-14	3,330	Planned facility

[a] Schedules and capacities for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

Source: WSRC 1995a.

Table E.2.6–9. Waste Disposal at Savannah River Site

Disposal Unit	Input Capability	Capacity[a,b] (m^3)	Comment
Hazardous/Mixed Waste Disposal Vaults	Solid mixed LLW, listed (CIF, Ashcrete, blowdown, and vitrified)	45,600	10 vaults are planned and funded, RCRA submitted 1990, available 2002.
Intermediate-Level Waste Vaults	Solid LLW	27,000	2 vaults operational, additional 5 planned
Low Activity Waste Vaults	Solid LLW, compacted waste, contaminated equipment, filters, sediment, job control waste, process beds, soils, resins, lithium-aluminum melted forms	61,500	1 vault constructed, additional 12 planned.
LLW Disposal Facility, Slit Trenches	Solid LLW	407,000	58 trenches planned
Z-Area Saltstone Vaults	Solid LLW	1,110,000	2 vaults operational, additional 12 vaults planned

[a] Schedules and capacities for the facilities under design or construction are subject to changes such as availability of funds and permit issuance.

[b] Includes current capacity and projections through 2024.

Source: SR DOE 1994b; SR DOE 1995c; WSRC 1995a; WSRC 1995b.

Table E.2.6–10. Mixed Low-Level Waste Inventory at Savannah River Site

Waste Matrix	Number of Waste Streams	Inventory as of September 30, 1994 (m^3)	Number of Waste Streams 5-Year Projection	Total Generation 5-Year Projection (m^3)
Aqueous liquids/slurries	6	158	8	4,692
Organic liquids	3	139	4	587
Homogeneous solids	12	2,726	5	155
Debris	12	4,069	13	3,840
Lab packs	1	8	1	5
Special waste	4	83	4	32
Soil/gravel	2	17	0	0
Total	40	7,200	35	9,311

Source: DOE 1995gg; WSRC 1995a; WSRC 1995b.

Table E.2.6–11. Hazardous Waste Storage Facilities at Savannah River Site

Storage Unit	Input Capability	Capacity (m^3)	Comment
Solid Waste Storage Pads	Solid waste only	1,758	Located within fenced area of N-Area
316-M	Containerized hazardous waste	117	RCRA-permitted
710-B	Containerized hazardous waste	146	RCRA-permitted
645-N	Containerized hazardous waste	171	RCRA-permitted
645-4N	Containerized hazardous waste	426	RCRA-permitted

Source: SR DOE 1995c.

E.3 PROJECT-SPECIFIC WASTE MANAGEMENT ACTIVITIES

This section describes in detail the waste management activities at the facilities being evaluated in this PEIS for the proposed long-term storage and disposition of weapons-usable fissile materials. All facilities that would support the storage and disposition program would be designed to be fully compliant with DOE orders and all applicable Federal and State environmental regulations and statutes. Facility designs incorporate waste minimization and pollution prevention. To facilitate waste minimization, where possible, nonhazardous materials would be substituted for those materials that contribute to the generation of hazardous or mixed waste. Material from the waste streams would be treated, where possible, to facilitate disposal as nonhazardous wastes. Future D&D considerations have also been incorporated into the designs. The estimated waste quantities generated in the proposed facilities are conservative so as to provide an upper bound. Once a facility is built and operational, a significant decrease in waste generation would occur by incorporating future technologies.

Solid and liquid nonhazardous wastes generated during construction would include concrete and steel construction waste materials and sanitary wastewater. The steel construction waste would be recycled as scrap material before completing construction. The remaining nonhazardous wastes generated during construction would be disposed of as part of the construction project by the contractor. Uncontaminated wastewater would be used for soil compaction and dust control, and excavated soil would be used for grading and site preparation. Wood, paper, and metal wastes would be shipped offsite to a commercial contractor for recycling. Hazardous wastes such as adhesives, motor oil, and lubricants would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment, storage, and disposal facilities. Except for the HEU storage upgrade at Y–12, no radioactive waste would be generated during construction. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any contaminated soil is generated it would be managed in accordance with site practice and all applicable Federal and State regulations.

E.3.1 FISSILE MATERIAL LONG-TERM STORAGE FACILITIES

The Preferred Alternative for the long-term storage of surplus Pu involves a combination of upgrade (SRS, ORR, and Pantex), No Action (Hanford, NTS, INEL, and LANL), and phaseout (RFETS).

This section describes the waste management activities at facilities that would provide long-term (50 years) storage for weapons-usable fissile material. Table E.3.1–1 lists the types of wastes expected to be generated from the long-term storage of Pu. There is no generation of spent nuclear fuel or HLW associated with the storage of Pu.

Table E.3.1–2 lists the types of wastes expected to be generated from the long-term storage of uranium. There is no generation of spent nuclear fuel, HLW, or TRU waste associated with the storage of uranium.

Table E.3.1–1. Waste Types Generated From Long-Term Storage of Plutonium

Plutonium Storage	
Liquid TRU	**Solid TRU**
Decontamination solutions	Damaged primary containment vessels
	Contaminated glovebox panels, windows, gaskets
Liquid Mixed TRU	**Solid Mixed TRU**
None	Leaded gloves
	Leaded windows
	Contaminated lead shielding
	Contaminated cleaning materials
Liquid LLW	**Solid LLW**
Decontamination solutions	Contaminated damaged secondary containers or overpack materials
Laboratory solutions	
Exhaust condensate	Filters (HEPA and prefilters)
Fire sprinkler effluent	Glovebox gloves
Oil and hydraulic fluids from materials handling equipment	Decontamination equipment and materials (health physics swipes, mops)
	Protective clothing
Liquid Mixed LLW	**Solid Mixed LLW**
Contaminated lubricants	Contaminated shielding
Contaminated cleaning solvents	Contaminated cleaning materials
Contaminated lube oil	
Liquid Hazardous	**Solid Hazardous**
Lubricants	Lead packing
Cleaning solvents	Wipes
Lube oil	Solid materials contaminated with oils, lubricants, and cleaning solvents
Hydraulic fluids from mechanical equipment	
Antifreeze solutions	
Paint	
Vacuum pump oils	
Liquid Nonhazardous	**Solid Nonhazardous**
Sanitary wastewater	Clean non-Pu metals
Utility wastewater	Shipping package packing materials
Process wastewater	Defective and damaged equipment, instruments, packing materials, and other materials outside of the radiation control area
Cooling system blowdown	
Stormwater runoff	
	Office supplies
	Industrial waste from utility and maintenance operations

Source: DOE 1996e; HF DOE 1996a; IN DOE 1996a; NT DOE 1996a; PX DOE 1996a; PX MH 1994a; SR DOE 1994e.

Table E.3.1–2. Waste Types Generated From Long-Term Storage of Uranium

Uranium Storage	
Liquid LLW	**Solid LLW**
Decontamination solutions	Packaging materials
Laboratory solutions	Filters (high-efficiency particulate air and prefilters)
Exhaust condensate	Glovebox gloves
Fire sprinkler effluent	Protective clothing
Oil and hydraulic fluids from materials	Decontamination equipment and materials (health physics swipes, mops)
Liquid Mixed LLW	**Solid Mixed LLW**
Contaminated lubricants	Contaminated shielding
Contaminated cleaning solvents	Contaminated cleaning materials
Contaminated lube oil	
Liquid Hazardous	**Solid Hazardous**
Lubricants	Lead packing
Cleaning solvents	Wipes
Lube oil Hydraulic fluids from mechanical equipment	Solid materials contaminated with oils, lubricants, and cleaning solvents
Antifreeze solutions	
Paint	
Vacuum pump oils	
Liquid Nonhazardous	**Solid Nonhazardous**
Sanitary wastewater	Shipping package packing materials
Utility wastewater Process wastewater Cooling system blowdown	Defective and damaged equipment, instruments, packing materials, and other materials outside of the radiation control area
Stormwater runoff	Office supplies
	Industrial waste from utility and maintenance operations

Source: DOE 1996f; NT DOE 1996a; OR MMES 1996a.

E.3.1.1 Upgrade Alternative

This section contains the construction and operational waste volumes (Tables E.3.1.1–1 through E.3.1.1–4), and waste management block diagrams (Figures E.3.1.1–1 through E.3.1.1–3) for the facilities that would provide long-term (50 years) storage for weapons-usable fissile materials through the upgrading of existing storage facilities. Tables E.3.1.1–5 through E.3.1.1–9 reflect the incorporation of all or some of the material from the RFETS or Los Alamos National Laboratory in upgraded facilities.

Table E.3.1.1–1. Estimated Waste Volumes for the Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative at Hanford Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	20	20
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	0.08[a]	None
Solid	None	85	42[b]
Mixed Low-Level			
Liquid	None	None	None
Solid	None	5	5
Hazardous			
Liquid	Included in solid	0.57	0.57
Solid	0.38	4	4
Nonhazardous (Sanitary)			
Liquid	3,880[c]	8,330	None
Solid	21[d]	917	459[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	None	None

[a] Liquid LLW would be treated and solidified prior to disposal.
[b] Assumes compaction of 4:1 for compactible solid LLW and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 2.7 t of steel construction waste material that would be recycled as scrap metal.
Source: HF DOE 1996a.

Table E.3.1.1–2. Estimated Waste Volumes for the Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative at Idaho National Engineering Laboratory, Argonne National Laboratory-West

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.004[a]	None
Solid	None	2	1[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	1	1
Low-Level			
Liquid	None	0.79[a]	None
Solid	None	500	250[b]
Mixed Low-Level			
Liquid	None	0.015	0.015
Solid	None	27	27
Hazardous			
Liquid	5.7	0.15	0.15
Solid	23	1	1
Nonhazardous (Sanitary)			
Liquid	4,000[c]	7,600	None
Solid	34[d]	240	120[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	310[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being solidified.
[b] Assumes compaction factor of 4:1 for compactible solid TRU waste,low-level , and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 6.3 t of steel construction waste material that would be recycled as scrap metal.
[e] Recyclable wastes.
Source: IN DOE 1996a.

Table E.3.1.1–3. Estimated Waste Volumes for the Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative at Pantex Plant

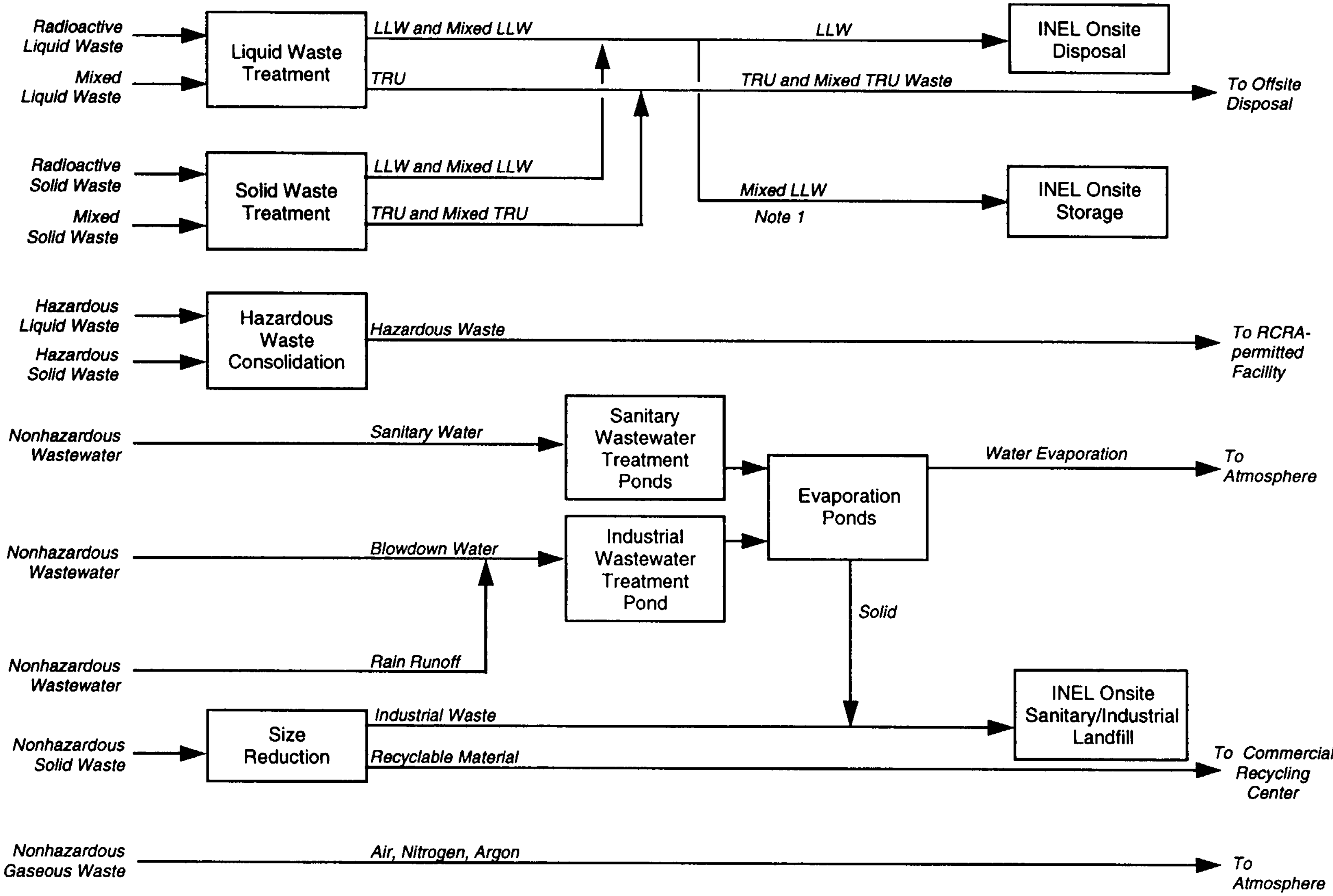
Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	0.8	0.8
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	0.08[a]	None
Solid	None	138	69[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	8	8
Hazardous			
Liquid	Included in solid	1	1
Solid	0.05	1.5	1.5
Nonhazardous (Sanitary)			
Liquid	3,130[c]	12,900	12,900
Solid	1.3[d]	275	138[c]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	344[e]	None

[a] Liquid LLW would be treated with the remaining sludge being solidified.
[b] [Text deleted.] Assumes compaction factor of 4:1 for compactible solid LLW and nonhazardous waste.
[c] [Text deleted.] Does not include groundwater dewatering, if required.
[d] Includes concrete and 0.18 t of steel construction waste material that would be recycled as scrap metal.
[e] Recyclable wastes.
[Text deleted.]
Source: PX MH 1994a.

Table E.3.1.1–4. Estimated Waste Volumes for the Upgrade Alternative at Y–12 Plant

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	None	None
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	0.04[a]	None
Solid	8[b]	3	2[c]
Mixed Low-Level			
Liquid	None	0.02	0.02
Solid	None	0.8	0.8
Hazardous			
Liquid	None	Included in mixed LLW	Included in mixed LLW
Solid	None	Included in mixed LLW	Included in mixed LLW
Nonhazardous (Sanitary)			
Liquid	1,010	0.8	0.8
Solid	5[d]	31	15[c]
Nonhazardous (Other)			
Liquid	Included in sanitary	0.8	0.8
Solid	Included in sanitary	0.8	0.8

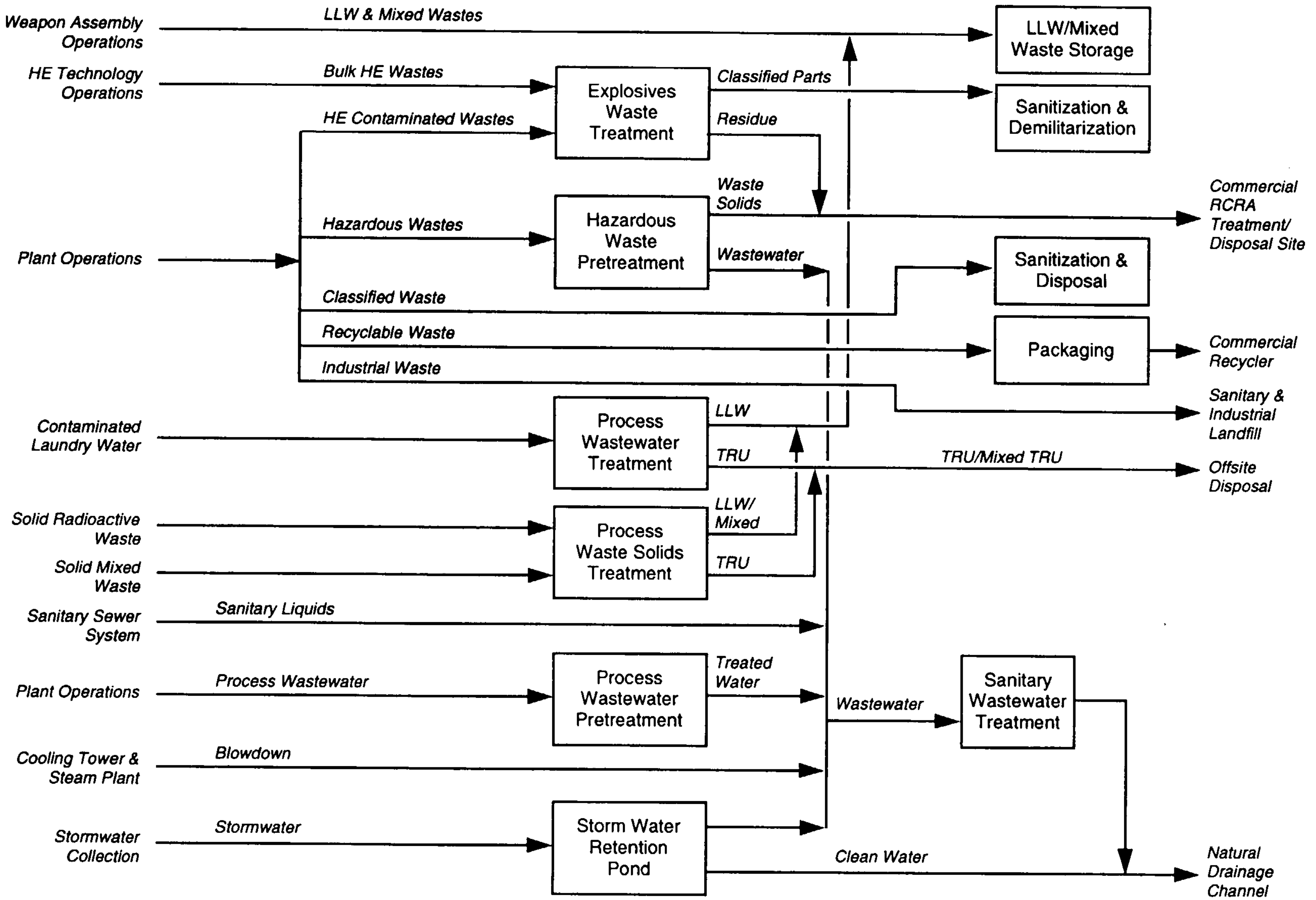
[a] Liquid LLW would be treated with the remaining sludge being solidified.
[b] Includes concrete and 3 t of steel which is contaminated.
[c] [Text deleted.] Assumes compaction factor of 4:1 for compactible solid LLW and nonhazardous waste.
[d] Includes concrete and 1.5 t of steel construction waste material that would be recycled as scrap metal.
Source: OR MMES 1996a.



Note: 1. Mixed LLW would be treated and disposed of in accordance with INEL Site Treatment Plan.
Source: IN DOE 1996a.

2522/FMD

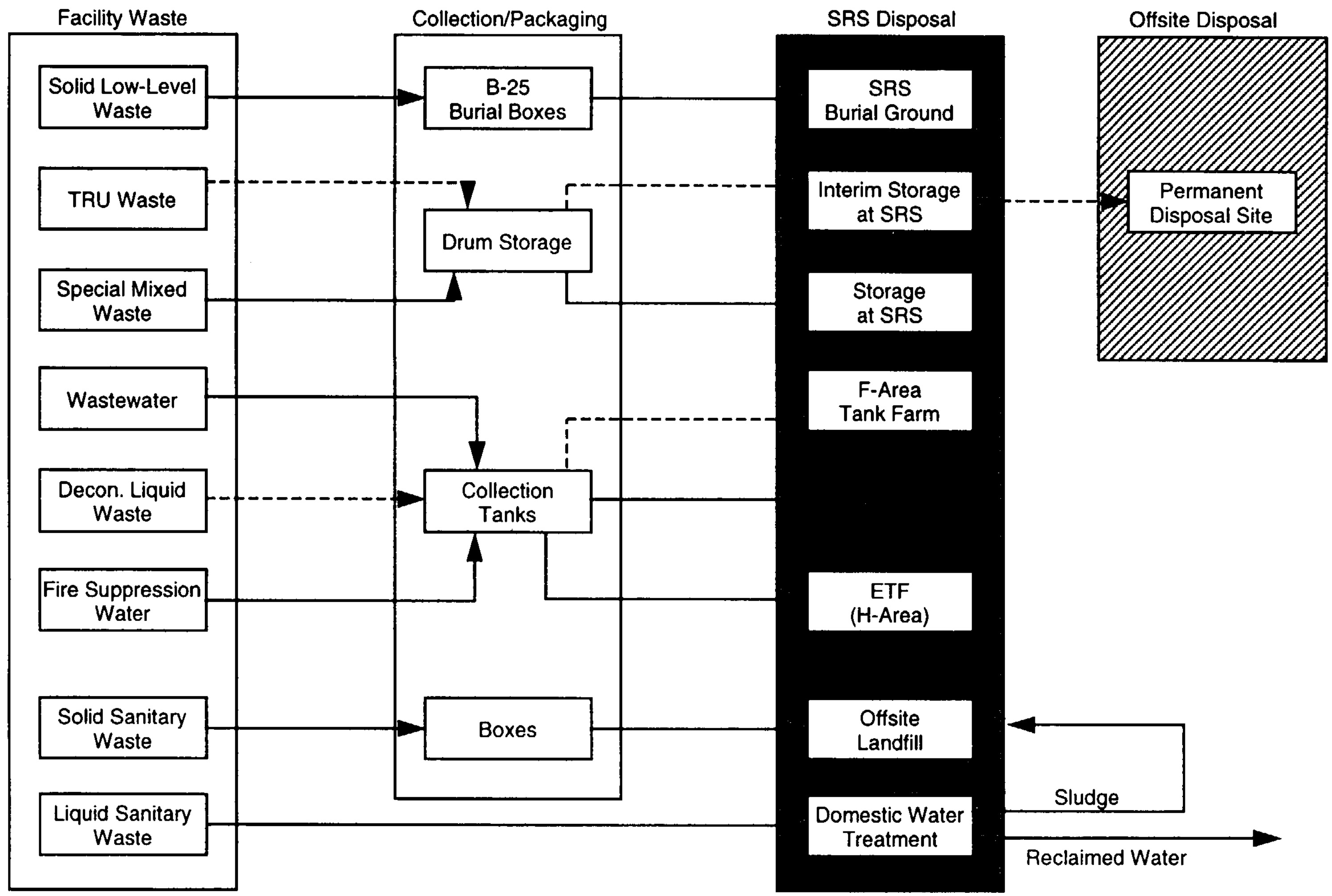
Figure E.3.1.1–1. Overall Waste Management System for the Upgrade Alternative at Idaho National Engineering Laboratory, Argonne National Laboratory-West.



Source: PX MH 1994a.

2466/FMD

Figure E.3.1.1–2. Overall Waste Management System for the Upgrade Alternative at Pantex Plant.



Source: SR DOE 1994e.

2470/FMD

Figure E.3.1.1–3. Overall Waste Management System for the Upgrade Alternative at Savannah River Site.

Table E.3.1.1–5. Estimated Waste Volumes for the Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative at Hanford Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	21	21
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	0.08[a]	None
Solid	None	89	45[b]
Mixed Low-Level			
Liquid	None	None	None
Solid	None	5	5
Hazardous			
Liquid	0.2	0.57	0.57
Solid	1.4	4	4
Nonhazardous (Sanitary)			
Liquid	5,880[c]	8,780	None
Solid	37[d]	967	483
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	None	None

[a] Liquid LLW would be treated and solidified prior to disposal.
[b] Assumes compaction factor of 4:1 for compactible solid LLW and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 4.4 t of steel construction waste material that would be recycled as scrap metal.
[Text deleted.]
Source: HF DOE 1996a.

Table E.3.1.1–6. Estimated Waste Volumes for the Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative at Idaho National Engineering Laboratory, Argonne National Laboratory-West

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.004[a]	None
Solid	None	2	1[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	1	1
Low-Level			
Liquid	None	0.79[a]	None
Solid	None	500	250[b]
Mixed Low-Level			
Liquid	None	0.14	0.14
Solid	None	27	27
Hazardous			
Liquid	6.3	1.3	1.3
Solid	26	1	1
Nonhazardous (Sanitary)			
Liquid	6,100[c]	10,300	None
Solid	49[d]	346	173[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	440[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being solidified.
[b] [Text deleted.] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 8 t of steel construction waste material that would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: IN DOE 1996a.

Table E.3.1.1–7. Estimated Waste Volumes for the Upgrade With Rocky Flats Environmental Technology Site Plutonium Pit Subalternative at Pantex Plant

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	0.8	0.8
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	0.08[a]	None
Solid	None	138	69[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	8	8
Hazardous			
Liquid	Included in solid	1	1
Solid	0.05	1.5	1.5
Nonhazardous (Sanitary)			
Liquid	3,130[c]	12,900	12,900
Solid	1.3[d]	275	138[e]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	344[f]	None

[a] Liquid LLW would be treated with the remaining sludge being solidified.
[b] [Text deleted.] Assumes compaction factor of 4:1 for compactible solid LLW.
[c] [Text deleted.] Does not include groundwater dewatering, if required.
[d] Includes concrete and 0.18 t of steel construction waste material that would be recycled as scrap metal.
[e] Assumes a compaction factor of 4:1 for compactible solids.
[f] Recyclable wastes.
[Text deleted.]
Note: Waste volumes for the Upgrade with All or Some RFETS and LANL Pu material are bounded by the Consolidation Alternative Modifying Existing and Constructing a New Facility in Zone 12 South at Pantex Plant (Table E.3.1.2–5).
Source: PX MH 1994a.

Table E.3.1.1–8. Estimated Waste Volumes for the Upgrade With Rocky Flats Environmental Technology Site Non-Pit Plutonium Subalternative at Savannah River Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	None	None
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	Included in Solid	None	None
Solid	0.33	0.56	0.56
Nonhazardous (Sanitary)	1,680[a]	1,490[b]	1,480
Liquid	4.5[c]	13	11[d]
Solid			
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	13[e]	None

[a] [Text deleted.] Does not include groundwater dewatering, if required.
[b] Assumes a 350:1 wastewater/sludge ratio in the treatment of liquid sanitary waste.
[c] Includes concrete and 2.3 t of steel construction waste material that would be recycled as scrap metal.
[d] Includes sludge (5 m^3) from sanitary treatment which goes to land applicator. Compactible solids compacted by a factor of 4:1.
[e] Recyclable wastes.
Source: SR DOE 1994e; SRS 1996a:4.

Table E.3.1.1–9. Estimated Waste Volumes for the Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative at Savannah River Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	None	None
Mixed Transuranic			
Liquid	None	None	None
Solid	None	None	None
Low-Level			
Liquid	None	None	None
Solid	None	None	None
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	Included in solid	None	None
Solid	0.5	0.8	0.8
Nonhazardous (Sanitary)			
Liquid	2,370[a]	1,806[b]	1,800
Solid	19[c]	18	14[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	18[e]	None

[a] [Text deleted.] Does not include groundwater dewatering, if required.
[b] Assumes a 350:1 wastewater/sludge ratio in the treatment of liquid sanitary waste.
[c] Includes concrete and 2.3 t of steel construction waste material that would be recycled as scrap metal.
[d] Includes sludge (5 m^3) from sanitary treatment which goes to land applicator. Compactible solids compacted by a factor of 4:1.
[e] Recyclable wastes.
Source: SR DOE 1994e; SRS 1996a:4.

E.3.1.2 Consolidation Alternative

This section contains the construction and operational waste volumes (Tables E.3.1.2–1 through E.3.1.2–7) and waste management block diagrams (Figures E.3.1.2–1 through E.3.1.2–4) associated with the storage facilities for the consolidation alternative.

Table E.3.1.2–1. Estimated Waste Volumes for the Consolidation Alternative—Constructing a New Facility at Hanford Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	22	2	2
Solid	90	2	2
Nonhazardous (Sanitary)			
Liquid	7,670[c]	110,000	None
Solid	271[d]	1,140	570[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	1,400[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[Text deleted.]
[d] Includes concrete and 32 t of steel construction waste material which would be recycled as scrap metal.
[e] Recyclable wastes.
Source: DOE 1996e.

Table E.3.1.2–2. Estimated Waste Volumes for the Consolidation Alternative—Modifying P-Tunnel and Constructing New Material Handling Building at Nevada Test Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	92	2	2
Nonhazardous (Sanitary)			
Liquid	7,830[c]	135,000	None
Solid	271[d]	1,620	810[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,000[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 35 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: NT DOE 1996a.

Table E.3.1.2–3. Estimated Waste Volumes for the Consolidation Alternative—Constructing a New Facility at Nevada Test Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	92	2	2
Nonhazardous (Sanitary)			
Liquid	7,830[c]	114,000	None
Solid	288[d]	1,500	750[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	1,900[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 35 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996e.

Table E.3.1.2–4. Estimated Waste Volumes for the Consolidation Alternative—Constructing a New Facility at Idaho National Engineering Laboratory

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	92	2	2
Nonhazardous (Sanitary)			
Liquid	7,830[c]	65,900	None
Solid	271[d]	1,320	660[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	1,600[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 37 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996e.

Table E.3.1.2–5. Estimated Waste Volumes for the Consolidation Alternative—Modifying Existing and Constructing a New Facility in Zone 12 South at Pantex Plant

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	102	2	2
Nonhazardous (Sanitary)			
Liquid	8,000[c]	109,500	None
Solid	289[d]	1,560	780[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	1,900[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 42 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: PX DOE 1996a.

Table E.3.1.2–6. Estimated Waste Volumes for the Consolidation Alternative—Constructing a New Facility at Pantex Plant

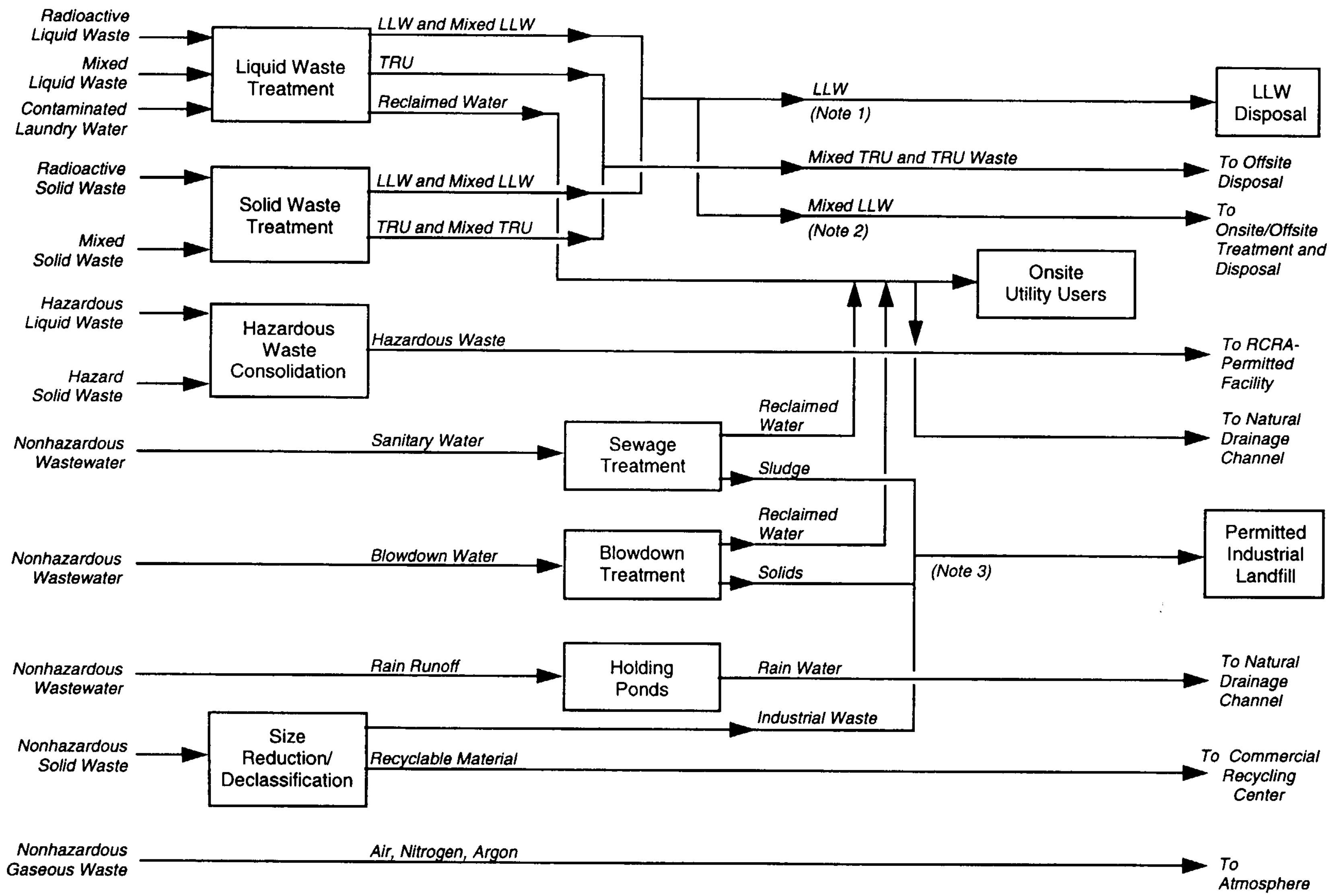
Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	97	2	2
Nonhazardous (Sanitary)			
Liquid	8,000[c]	97,800	None
Solid	305[d]	1,440	720[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	1,800[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 38 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996e.

Table E.3.1.2–7. Estimated Waste Volumes for the Consolidation Alternative—Constructing a New Facility at Savannah River Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	95	2	2
Nonhazardous (Sanitary)			
Liquid	8,000[c]	168,830	168,770
Solid	305[d]	1,480	740[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	1,800[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 38.3 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996e.

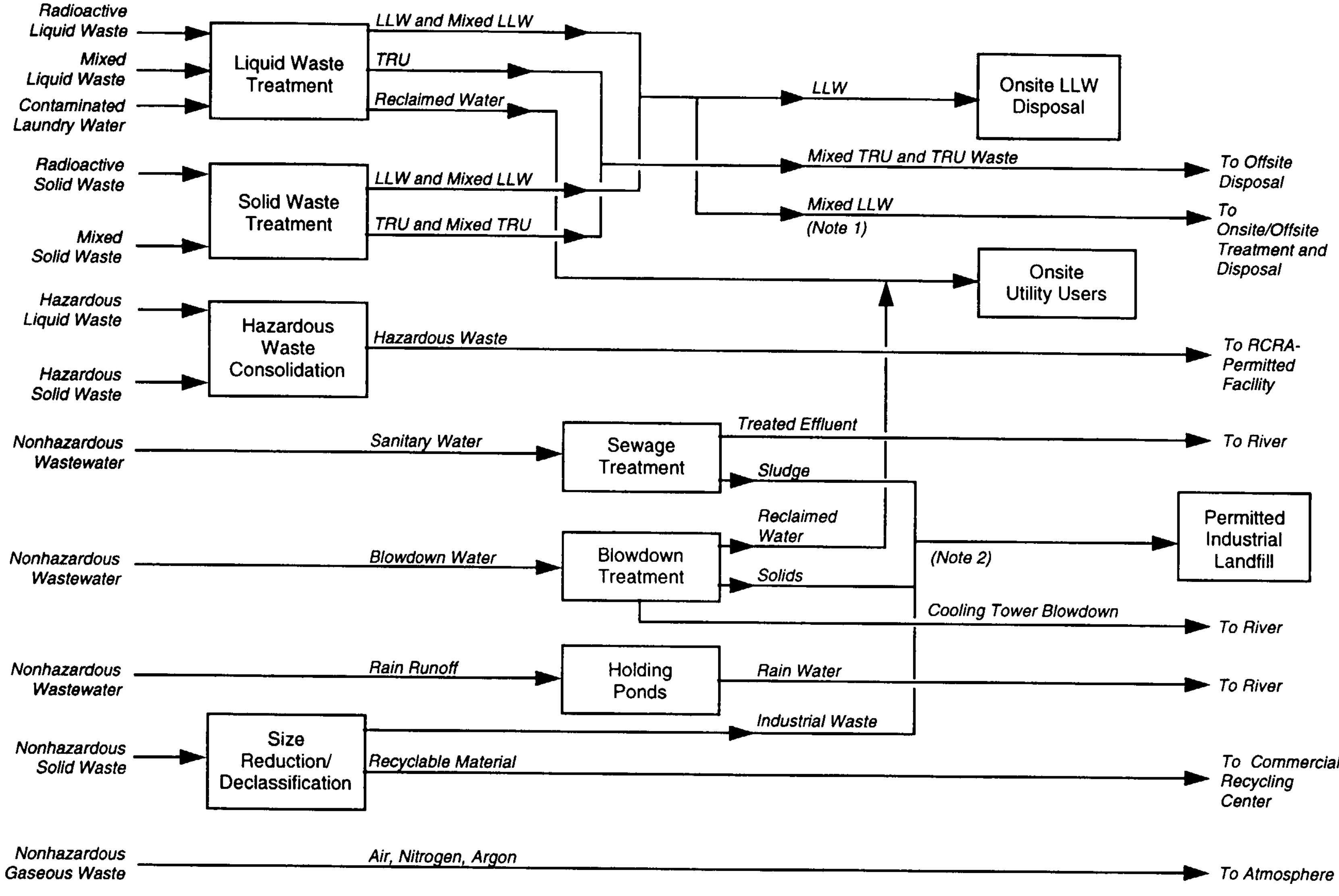


Note: 1. LLW is disposed of according to site practice: onsite at Hanford, NTS, and INEL; offsite disposal at Pantex.
2. Mixed LLW would be treated and disposed of in accordance with the site treatment plan.
3. Sanitary/industrial waste would be disposed of according to site practice: onsite at Hanford, NTS, and INEL; offsite at Pantex.

Source: DOE 1996e.

2493/S&D

Figure E.3.1.2–1. Overall Waste Management System for the Consolidation Alternative at Hanford Site, Nevada Test Site, Idaho National Engineering Laboratory, or Pantex Plant.

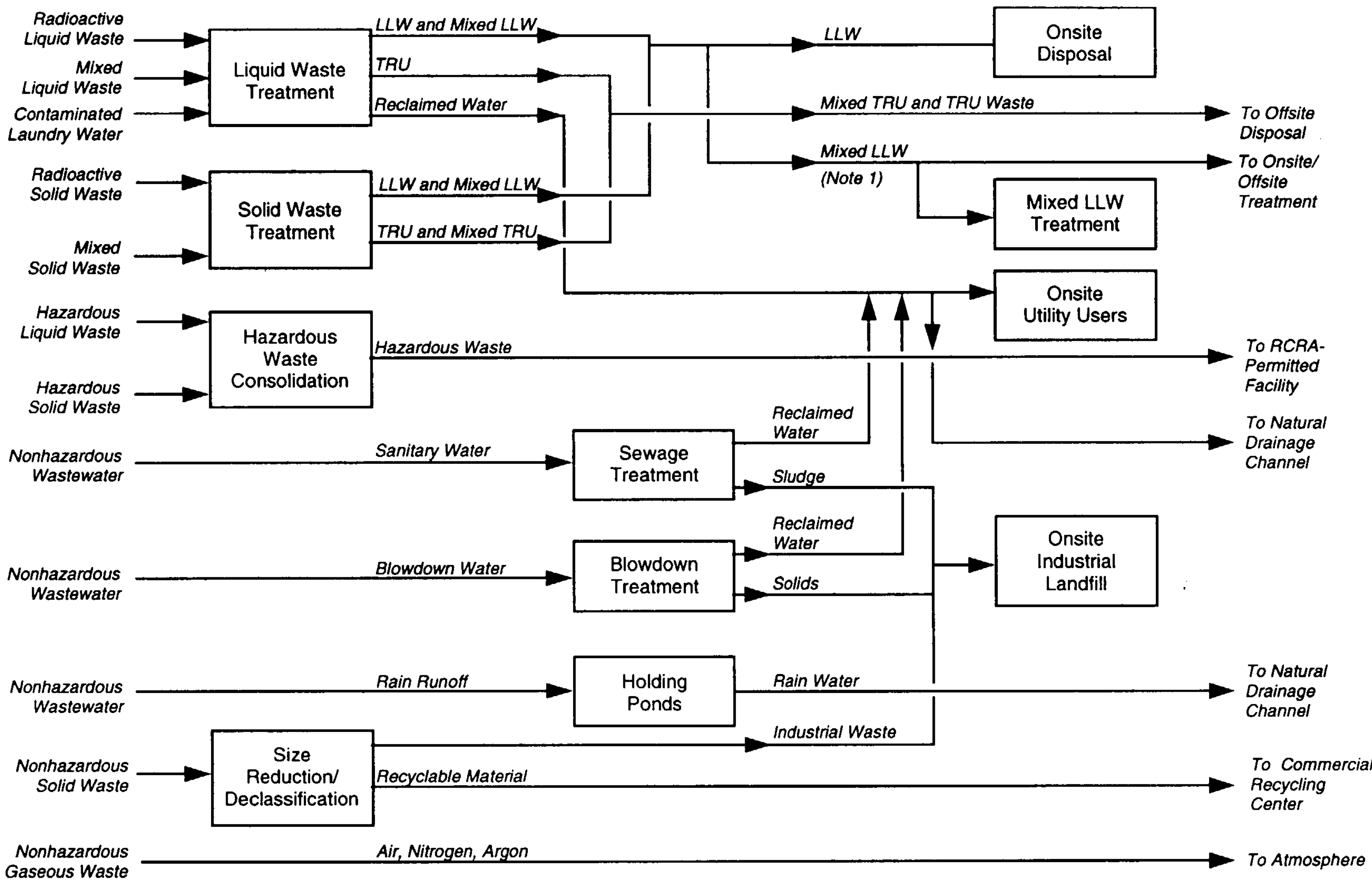


Note: 1. Mixed LLW would be treated and disposed of in accordance with the site treatment plan.
2. Sanitary/industrial waste would be disposed of according to site practice.

Source: DOE 1996e.

2494/S&D

Figure E.3.1.2–2. Overall Waste Management System for the Consolidation Alternative at Savannah River Site.

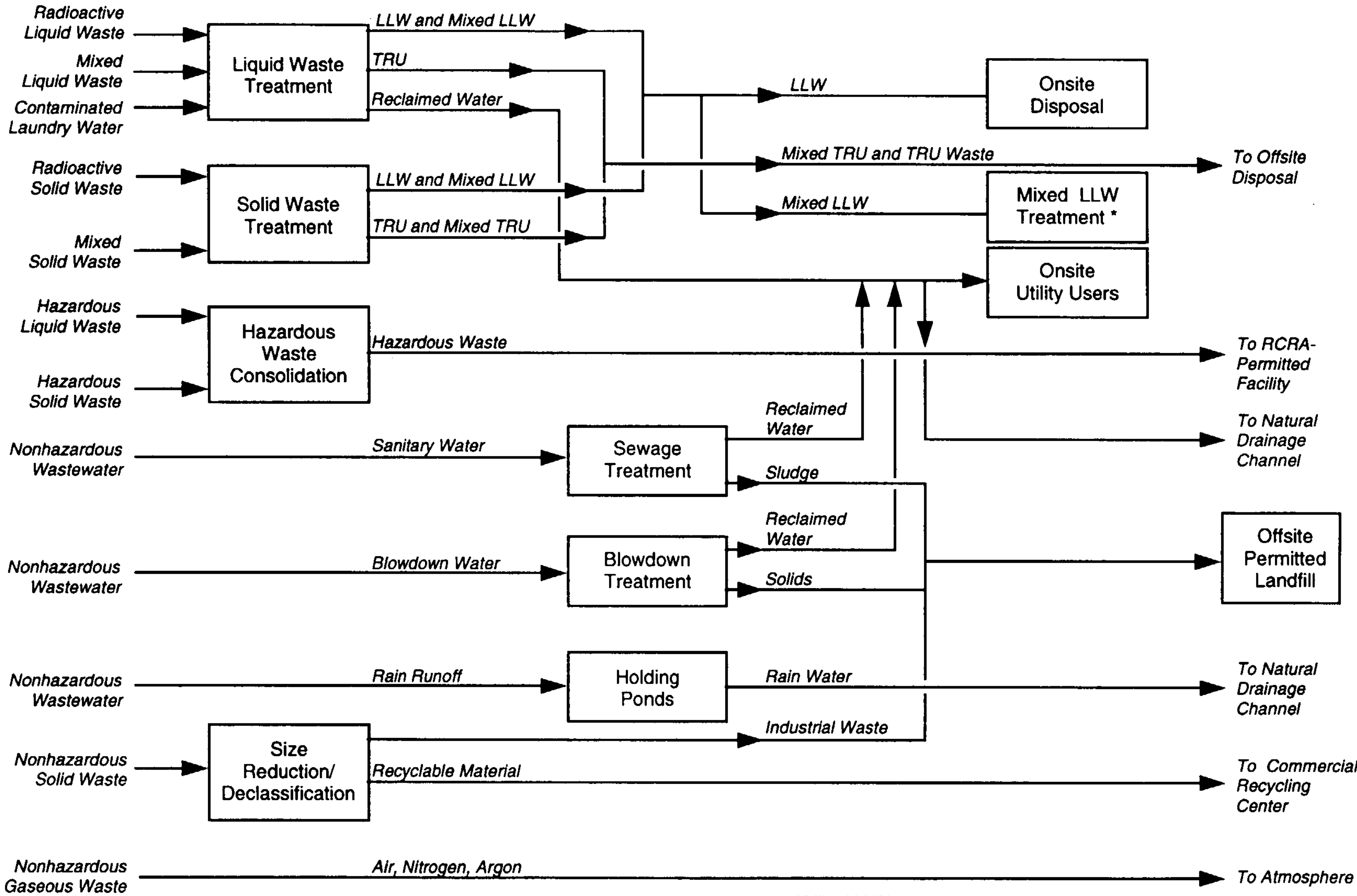


Source: NT DOE 1996a.

Note: 1. Mixed LLW would be managed in accordance with NTS Site Treatment Plan.

2476/S&D

Figure E.3.1.2–3. Overall Waste Management System for the Consolidation Alternative—Modifying P-Tunnel and Constructing New Material Handling Building at Nevada Test Site.



* Mixed LLW would be treated and disposed of in accordance with the Pantex Site Treatment Plan.

Source: PX DOE 1996a.

2507/FMD

Figure E.3.1.2–4. Overall Waste Management System for the Consolidation Alternative—Modifying Existing and Constructing New Facility in Zone 12 South at Pantex Plant.

E.3.1.3 Collocation Alternative

This section contains the construction and operational waste volumes (Tables E.3.1.3–1 through E.3.1.3–8) and waste management block diagrams (Figures E.3.1.3–1 through E.3.1.3–4) associated with the storage facilities for the collocation alternative. At ORR, a new Pu storage facility (Table E.3.1.3–6 and Figure E.3.1.3–2) would be constructed in conjunction with maintaining or upgrading HEU storage at Y–12; whereas, Table E.3.1.3–7 and Figure E.3.1.3–3 reflect a new facility for the storage of both Pu and HEU.

Table E.3.1.3–1. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Facility at Hanford Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	31	2	2
Solid	122	2	2
Nonhazardous (Sanitary)			
Liquid	12,500[c]	146,000	None
Solid	366[d]	1,760	880[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,200[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.

[Text deleted.]

[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.

[c] Does not include groundwater dewatering, if required.

[d] Includes concrete and 42.5 t of steel construction waste material which would be recycled as scrap metal.

[Text deleted.]

[e] Recyclable wastes.

Source: DOE 1996f.

Table E.3.1.3–2. ***Estimated Waste Volumes for the Collocation Alternative—Modifying P-Tunnel and Constructing New Material Handling Building at Nevada Test Site***

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	27	2	2
Solid	108	2	2
Nonhazardous (Sanitary)			
Liquid	8,670[c]	189,000	None
Solid	339[d]	1,960	980[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,500[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 48 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: NT DOE 1996a.

Table E.3.1.3–3. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Facility at Nevada Test Site

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	31	2	2
Solid	125	2	2
Nonhazardous (Sanitary)			
Liquid	12,600[c]	153,000	None
Solid	383[d]	1,900	950[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,400[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 47.5 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996f.

Table E.3.1.3–4. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Facility at Idaho National Engineering Laboratory

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	33	2	2
Solid	129	2	2
Nonhazardous (Sanitary)			
Liquid	12,800[c]	86,800	None
Solid	402[d]	1,720	860[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,100[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 51 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996f.

Table E.3.1.3–5. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Facility at Pantex Plant

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	33	2	2
Solid	130	2	2
Nonhazardous (Sanitary)			
Liquid	13,000[c]	129,500	None
Solid	401[d]	1,840	920[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	None
Solid	Included in sanitary	2,300[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 52.5 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996f.

Table E.3.1.3–6. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Plutonium Storage Facility; Maintaining or Upgrading Y–12 Plant

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2[a]	None
Solid	None	1,260	630[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	65	65
Hazardous			
Liquid	23	2	2
Solid	93	2	2
Nonhazardous (Sanitary)			
Liquid	7,830[c]	136,630	136,570
Solid	305[d]	1,340	670[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	1,700[e]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Includes concrete and 36.7 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[e] Recyclable wastes.
Source: DOE 1996e.

Table E.3.1.3–7. Estimated Waste Volumes for the Collocation Alternative—Constructing a New Plutonium and Highly Enriched Uranium Storage Facility at Oak Ridge Reservation

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	31	2	2
Solid	127	2	2
Nonhazardous (Sanitary)			
Liquid	13,000[c]	171,840	171,770[d]
Solid	406[e]	1,740	870[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	2,200[f]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.

[Text deleted.]

[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.

[c] Does not include groundwater dewatering, if required.

[d] Assumes a 350:1 wastewater/sludge ratio in the treatment of liquid sanitary waste.

[e] Includes concrete and 49.5 t of steel construction waste material which would be recycled as scrap metal.

[Text deleted.]

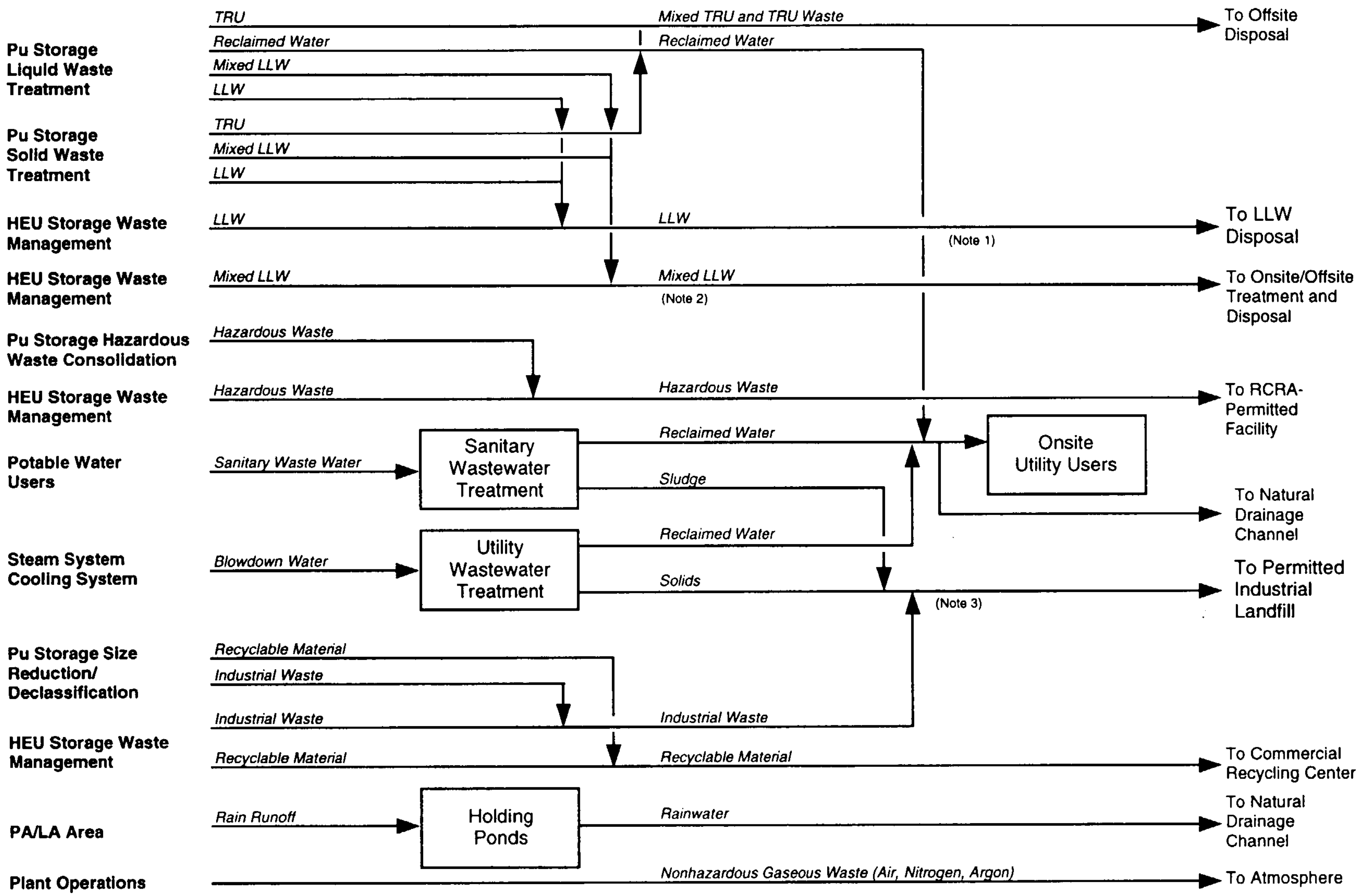
[f] Recyclable wastes.

Source: DOE 1996f.

Table E.3.1.3–8. ***Estimated Waste Volumes for the Collocation Alternative—Constructing a New Facility at Savannah River Site***

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.02[a]	None
Solid	None	10	5[b]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	2.1[a]	None
Solid	None	1,300	650[b]
Mixed Low-Level			
Liquid	None	0.2	0.2
Solid	None	66	66
Hazardous			
Liquid	33	2	2
Solid	130	2	2
Nonhazardous (Sanitary)			
Liquid	13,000[c]	214,890	214,820[d]
Solid	401[e]	1,880	940[b]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	Included in sanitary	2,300[f]	None

[a] Liquid TRU waste and LLW would be treated with the remaining sludge being vitrified.
[Text deleted.]
[b] Assumes compaction factor of 4:1 for compactible solid TRU, low-level, and nonhazardous waste.
[c] Does not include groundwater dewatering, if required.
[d] Assumes a 350:1 wastewater/sludge ratio in the treatment of liquid sanitary waste.
[e] Includes concrete and 52.5 t of steel construction waste material which would be recycled as scrap metal.
[Text deleted.]
[f] Recyclable wastes.
Source: DOE 1996f.

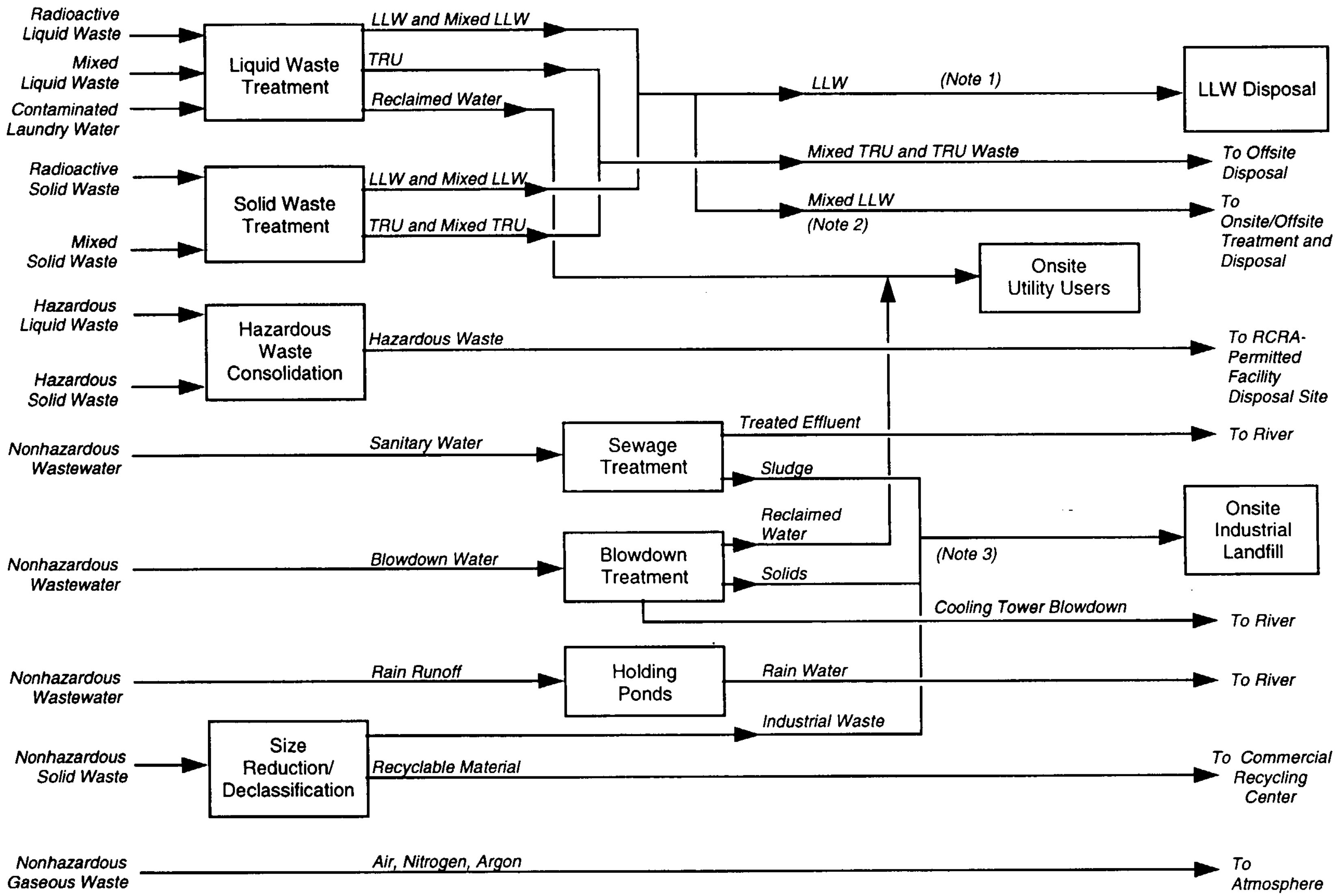


Note 1: LLW is disposed of according to site practice: onsite at Hanford, INEL and NTS; offsite at Pantex.
Note 2: Mixed LLW would be treated and disposed of in accordance with the site treatment plan.
Note 3: Sanitary/industrial waste would be disposed of according to site practice: onsite at Hanford, INEL, and NTS; offsite at Pantex.

Source: DOE 1996f.

2479/FMD

Figure E.3.1.3–1. Overall Waste Managemet System for the Collocation Alternative at Hanford Site, Idaho National Engineering Laboratory, Nevada Test Site, or Pantex Plant.

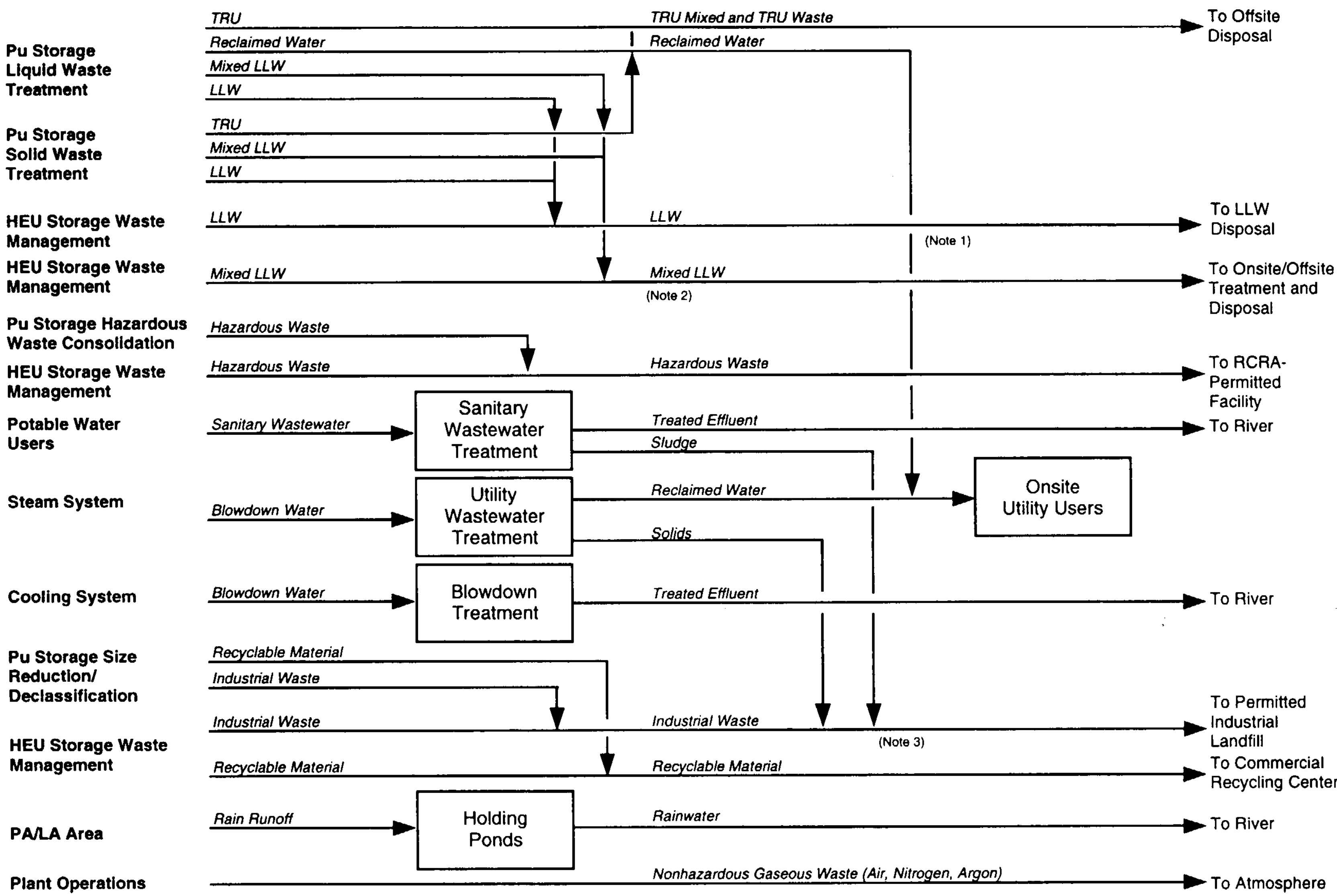


Source: DOE 1996e.

Note: 1. Onsite disposal at ORR is assumed.
2. Mixed LLW would be treated and disposed of in accordance with the ORR Site Treatment Plan.
3. Sanitary/industrial waste would be disposed of according to site practice.

3168/FMD

Figure E.3.1.3–2. Overall Waste Management System for the Collocation Alternative—Constructing a New Plutonium Storage Facility; Maintaining or Upgrading Y–12 at Oak Ridge Reservation.

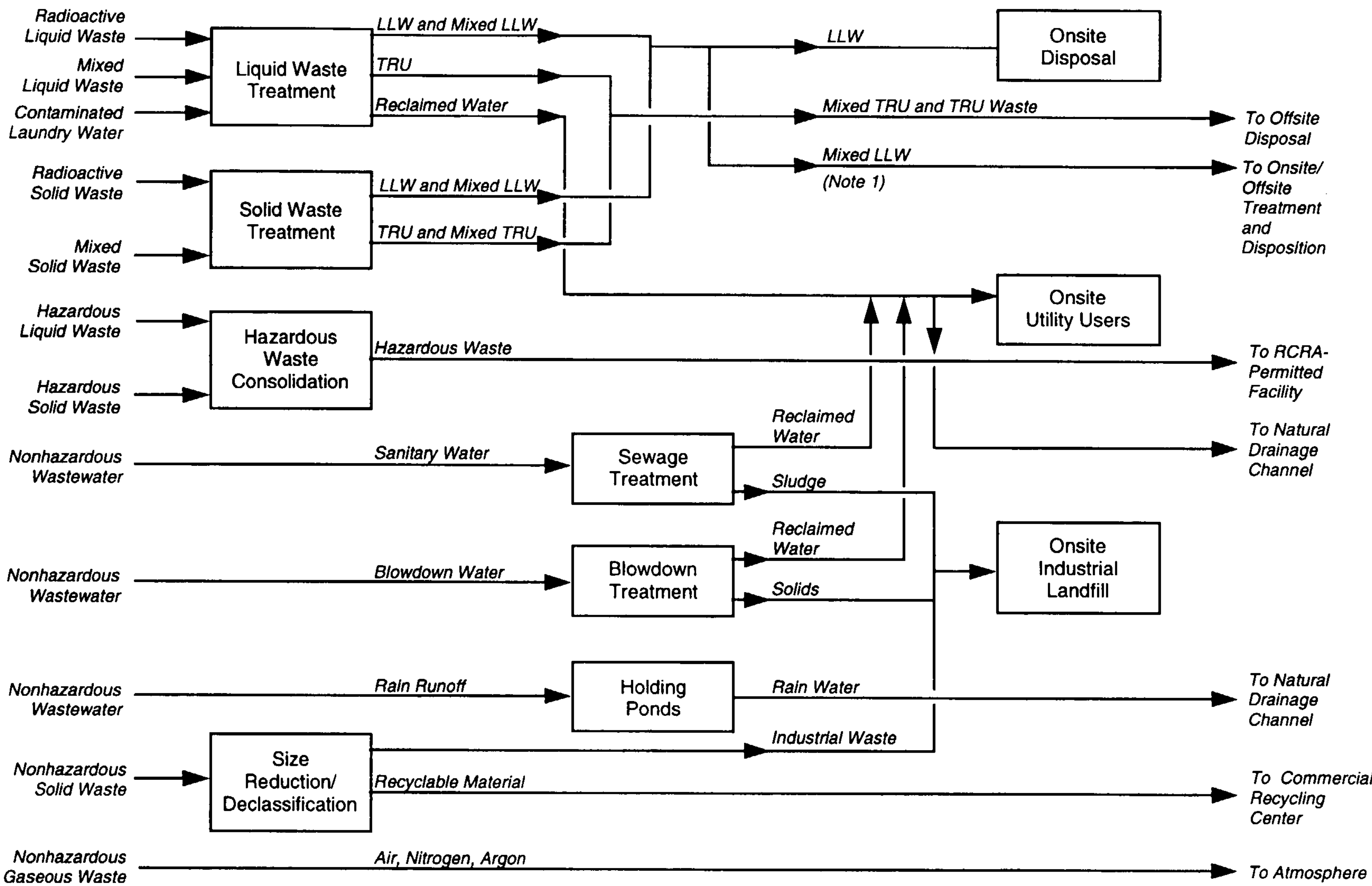


Note 1: LLW is disposed of according to site practice: onsite at SRS; onsite disposal at ORR is assumed.
Note 2: Mixed LLW would be treated and disposed of in accordance with the site treatment plan.
Note 3: Sanitary/industrial waste would be disposed of according to site practice: onsite at ORR; offsite or onsite at SRS.

Source: DOE 1996f.

2480/FMD

Figure E.3.1.3–3. Overall Waste Management System for the Collocation Alternative—Constructing a New Plutonium and Highly Enriched Uranium Storage Facility at Oak Ridge Reservation or Savannah River Site.



Source: NT DOE 1996a.

Note: 1. Mixed LLW would be managed in accordance with NTS Site Treatment Plan.

2476/S&D

Figure E.3.1.3–4. Overall Waste Management System for the Collocation Alternative—Modifying P-Tunnel and Constructing New Material Handling Building at Nevada Test Site.

E.3.2 FACILITIES COMMON TO MULTIPLE PLUTONIUM DISPOSITION ALTERNATIVES

Under the Preferred Alternative for surplus Pu disposition, the pit disassembly/conversion facility and the mixed oxide (MOX) fuel fabrication facility could each be located at either Hanford, INEL, Pantex, or SRS and the Pu conversion facility could be located at Hanford or SRS. The amount of waste generated from the construction of these alternatives could be reduced by using existing facilities for portions of the operations. The next tier of NEPA review will examine locations for the selected alternatives including the use of existing facilities.

E.3.2.1 Pit Disassembly/Conversion Facility

The design of the pit disassembly/conversion facility would place great emphasis on the minimization of both liquid and solid wastes. Where generation of a waste could not be avoided, methods would be pursued to recycle the waste. In general terms, waste management of the pit disassembly/conversion facility would include waste handling and treatment operations for processing the various wastes in aqueous, organic liquid, or solid form generated directly from pit conversion/disassembly operations or from related site activities.

Table E.3.2.1–1 presents the estimated annual waste volumes during construction and operation of the pit disassembly/conversion facility. Waste management capabilities would be provided to monitor, treat, and handle radiological wastes, industrial and chemical wastes, as well as sanitary and stormwater wastes. The treated effluent from utility, process, and sanitary wastewater treatment would be reclaimed and used as cooling system makeup water. The radioactive and nonradioactive waste management facilities would be located in the Pu processing building. This building would have space for the following: unloading and disassembly of retired Pu pits, separating of the Pu and other components, and the required processing of wastes for ultimate disposal. The waste treatment processes would include assay examination, sorting, separation, concentration, size reduction, special treatment, and thermal treatment. The wastes would be converted to either water meeting effluent standards, grouted cement, or compacted solid waste as final form products for disposal. Waste treatment processing would also perform equipment and waste container decontamination operations.

Following receipt of the retired pits, the initial phase of the processing would be disassembly and conversion. The pits would be parted and the Pu extracted and converted into metal or oxide using hydriding technology. If metal product was required, then the hydride would be converted back to metal by dehydriding. If oxide product was required, the hydride would be converted to oxide. A passivation furnace would be used in this phase to convert glovebox sweepings and residues into a stable oxide. A packaging station would be provided to package product metal or oxide and remove it from the glovebox line. The next phase would be residue recovery. Pu-contaminated components, equipment, and residues would be processed to remove the Pu. In addition, Pu residues such as passivated sweepings, crucibles, and some turnings would be processed to recover Pu. Product oxide from the residue recovery would be transferred to the disassembly/conversion area for packaging.

The wastes generated from pit disassembly/conversion and residue recovery operations would consist of low-level, mixed low-level, TRU, and mixed TRU wastes. The LLW would consist of paper and surgeon's gloves that would be discarded inside the radioactive materials area but external to gloveboxes. The TRU waste would be waste generated internal to the gloveboxes and would consist of failed equipment, stainless steel hemishells, combustibles, HEPA filters, and used vacuum pump oil. The mixed TRU waste would be principally leaded gloves.

Waste management involves the collection, assaying, sorting, treatment, packaging, storing, and shipping of radioactive, hazardous, and mixed wastes from Pu operations, and hazardous and nonhazardous waste from the support facilities. Two main subsystems, solid waste treatment and liquid waste treatment, would handle TRU, low-level, hazardous, and mixed wastes. Initial sorting of wastes would be performed at the source of generation. Wastes would be processed to ensure compliance with all applicable Federal and State statutes and regulations, as well as DOE Orders.

For solid waste treatment, as illustrated in Figure E.3.2.1–1, nonnuclear material, such as stainless steel, would be processed to form unclassified shapes and then be packaged for disposal. In addition, wastes from facility glovebox operations would be sorted, processed, and packaged for disposal. This subsystem contains nondestructive assay systems to assay waste material for Pu content and certify it as low-level or TRU waste. Following appropriate treatment, solid nonhazardous waste would be either disposed of at a permitted sanitary landfill or sent to a commercial recycling center. For liquid waste treatment, as illustrated in Figure E.3.2.1–2, solutions from the residue recovery subsystem would be treated to produce a disposable waste form. Typical processing would include: neutralization, filtration, immobilization, and certification for disposal. This subsystem would also contain the effluent and wastes from laundry facilities. Following appropriate treatment to below permitted levels, aqueous wastes would be discharged to natural drainage channels or permitted outfalls.

Any nonradiological wastes generated from operation would be monitored, collected, and treated, if necessary, before discharge to the environment. Facilities would be provided to treat chemically-contaminated wastewaters to below regulatory requirements before discharge to the environment. Holding tanks would be provided for the wastes. Nonradioactive solid wastes would be recycled where possible or transferred to approved disposal sites in accordance with accepted industrial practices and regulatory requirements.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater discharges (including cooling system and boiler blowdown) would be treated in an industrial wastewater treatment plant prior to discharge in accordance with applicable environmental standards. The facility design does not include a sanitary treatment plant to treat liquid sanitary waste; rather, the design assumes that such support infrastructure would already be in place.

High-Level Waste. The pit disassembly/conversion facility would not generate any HLW.

Transuranic Waste. TRU waste would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes, including those directly supporting pit disassembly and conversion, residue recovery, and analytical laboratory operation, and those managing the various waste streams, would produce used HEPA filters, retired gloveboxes, glovebox sweepings, failed equipment, declassified components, contaminated wipes and rags, combustibles, used vacuum pump oil, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal (assumed to be WIPP).

Transuranic waste would be treated in a waste handling facility to form grout or a compact solid waste. Should any liquid TRU waste be generated, it would be treated with the remaining TRU sludge being solidified. Treated TRU waste products would be packaged, assayed, and certified to meet the waste acceptance criteria of WIPP or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268 and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. This mixed TRU waste would be primarily generated from activities at the waste handling/management facilities. Mixed TRU waste would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Numerous processes, including those directly supporting pit disassembly and conversion, residue recovery, and analytical laboratory operation, and those managing the various waste streams, would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration, and size reduction processes. Should any liquid LLW be generated, it would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of onsite or offsite in a shallow burial site.

Mixed Low-Level Waste. A very small quantity of liquid and solid mixed LLW, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. This mixed LLW would be primarily generated from activities at the waste handling/management facilities. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site-specific treatment plan.

Hazardous Waste. Many of the pit disassembly/conversion facility processes would generate hazardous waste. This would include chemical makeup and reagents for support activities, lubricants and oils for process and support equipment, and used solvent rags. The liquid and solid hazardous waste would be collected and stored onsite on an interim basis. The hazardous waste would be recycled, or stored and packaged for offsite treatment or disposal at offsite commercial RCRA-permitted facilities.

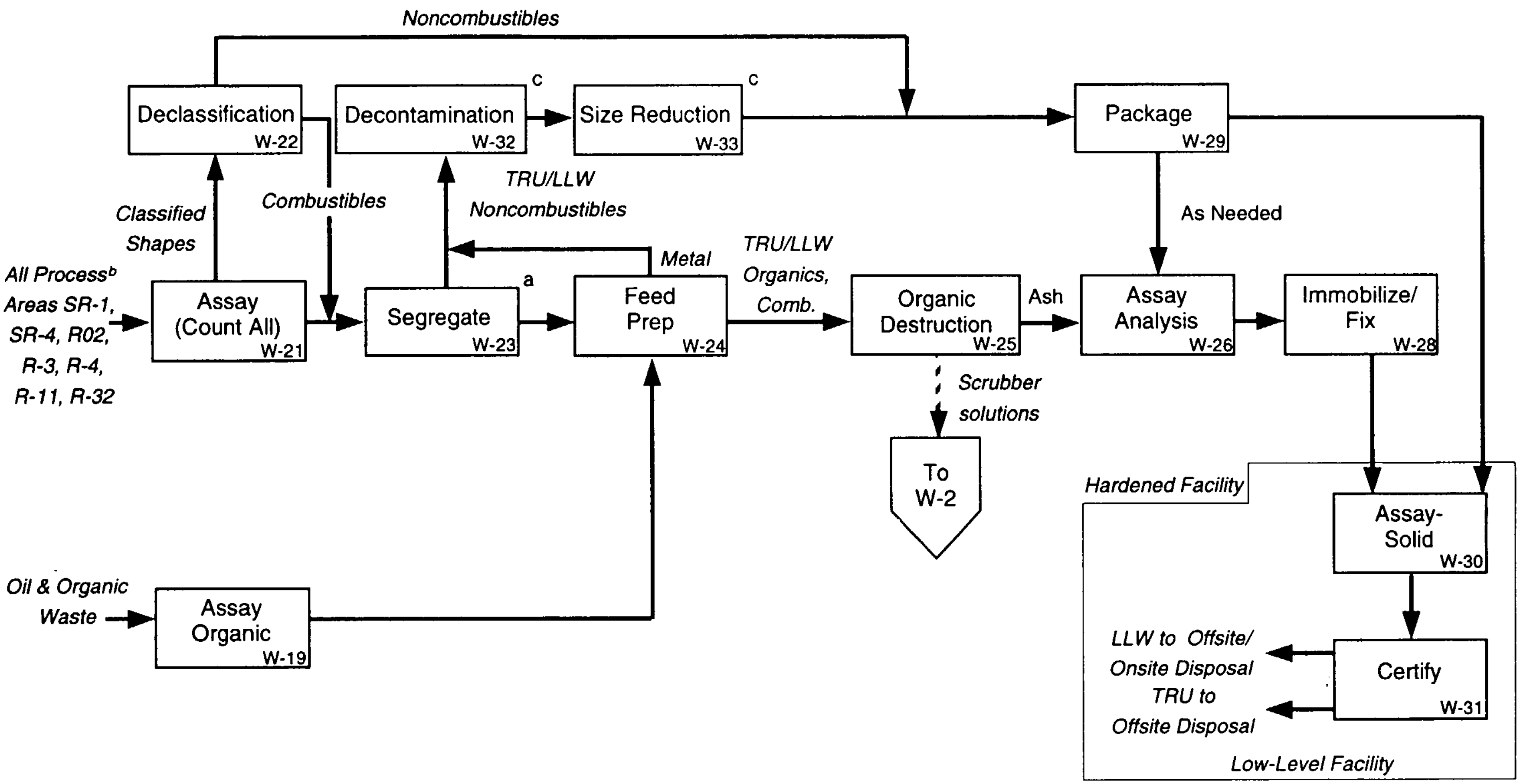
Nonhazardous (Sanitary) Waste. Liquid nonhazardous sanitary waste generated in the facility would be transferred to the sanitary waste system for treatment. Solid nonhazardous waste, such as domestic trash, office waste, cafeteria wastes, clean non-Pu wastes, and industrial wastes from utility and maintenance operations, would be transported to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other liquid nonhazardous waste generated from facilities support operations (for example, cooling system blowdown and evaporator condensate) would be collected in a catch tank and sampled before being reclaimed for other recycle use or release to the environment. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treatment system. Runoff outside of the main facility area would be discharged directly into the natural drainage channel or river.

Table E.3.2.1–1. Estimated Waste Volumes for Pit Disassembly/Conversion Facility

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	67[a]	67[a]
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4[a]	4[a]
Low-Level			
Liquid	None	4	None
Solid	None	102[b]	102[b]
Mixed Low-Level			
Liquid	None	0.4	0.4
Solid	None	1.7[b]	1.7[b]
Hazardous			
Liquid	35[c]	2	2
Solid	140[c]	0.7[d]	0.7[d]
Nonhazardous (Sanitary)			
Liquid	1,890[e]	85,200	85,200
Solid	Included in liquid sanitary	100[d]	100[d]
Nonhazardous (Other)			
Liquid	Included in sanitary	Included in sanitary	Included in sanitary
Solid	97[f]	3[d,g]	None

[a] Solid TRU and mixed TRU waste volumes were estimated using the conversion factor of 336.2 kg/m^3.
[b] Solid LLW and mixed LLW volumes were estimated using the conversion factor of 176.8 kg/m^3.
[c] Estimated from consolidated special nuclear materials storage facility (DOE 1996e).
[d] Solid waste volumes were estimated using the conversion factor of 1,500 kg/m^3.
[e] Does not include dewatering, if required.
[f] Includes 9.1 t of steel using the conversion factor of 0.127 m^3/t.
[g] Recyclable wastes.
Source: LANL 1996d.



Solid Waste

Liquid Waste

[a] Segregation Creates Six Streams: TRU, LLW, Mixed (Organic & Nonorganic).

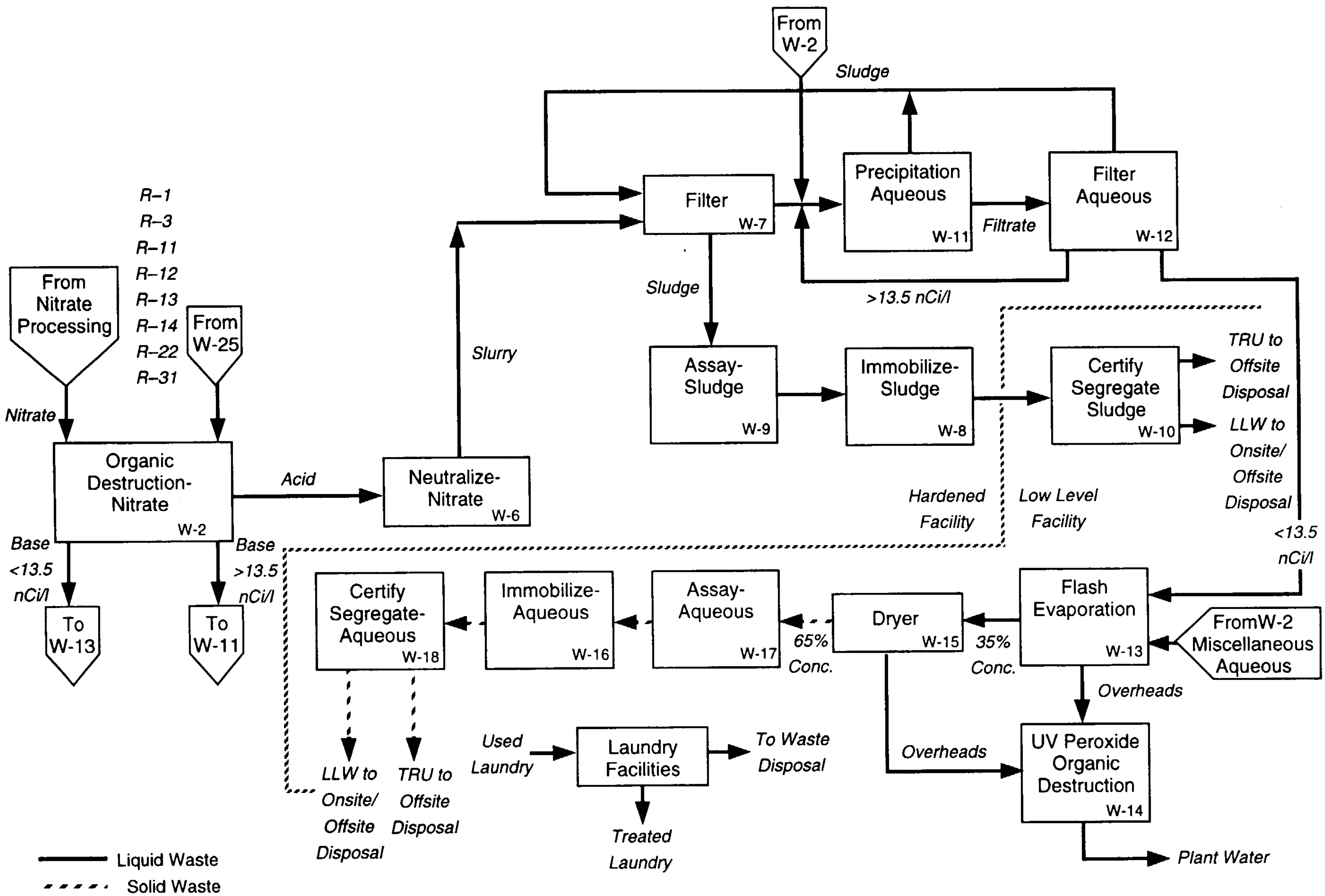
[b] Waste sorted at source location.

[c] Optional Process.

Source: LANL 1996d.

Figure E.3.2.1–1. Pit Disassembly/Conversion Facility Solid Waste Management Process Flow Diagram.

2811/S&D



Source: LANL 1996d.

2812/FMD

Figure E.3.2.1–2. Pit Disassembly/Conversion Facility Liquid Waste Management Process Flow Diagram.

E.3.2.2 Plutonium Conversion Facility

The design of the Pu conversion facility would place great emphasis on the minimization of both liquid and solid wastes. Where generation of a waste could not be avoided, methods would be pursued to recycle the waste, as well as any process reagents. In general terms, waste management of the Pu conversion facility would include waste handling and treatment operations for processing the various wastes in aqueous, organic liquid, or solid form generated directly from Pu conversion operations or from related site activities.

Table E.3.2.2–1 presents the estimated annual waste volumes during construction and operation of the Pu conversion facility. As illustrated in Figure E.3.2.2–1, waste management capabilities would be provided to monitor, treat, and handle radioactive wastes, industrial and chemical wastes, and sanitary and stormwater wastes. The treated effluent from utility, process and sanitary wastewater treatment would be reclaimed to be used as cooling system makeup water.

The radioactive and nonradioactive waste management capabilities that would be provided to handle the generated wastes would consist of the Process Building, Liquid Waste Treatment Facility, Long-Term Waste Storage Building, and a Sanitary Wastewater Treatment Plant. The Process Building would have space for handling and processing surplus fissile material into the accepted long- term storage form. It would also have space for support operations, including material control and accountability, safety systems, waste handling and management, repackaging, and assay and analysis. Liquid wastes collected from processing areas would be treated by the Liquid Waste Treatment Facility through neutralization, precipitation, and volume reduction via evaporation. Any sludge produced would be immobilized and packaged for disposal, while evaporated water would be recycled for use in the utility systems. The Long-Term Waste Storage Building would provide interim storage/staging for hazardous and low-level wastes. Hazardous waste would be transported from there to an approved offsite RCRA-permitted treatment and disposal facility. LLW would be transported to a DOE LLW disposal facility. In general, the wastes would be converted to either water meeting effluent standards, grouted cement, or compacted solid waste as final form products for disposal. The waste treatment processing would also perform equipment and waste container decontamination operations.

Following receipt and unpackaging of the surplus non-pit Pu, the initial phase of the processing would be material management, which would provide the interface between receiving and processing, and repackaging and storage. Material management would include sampling, nondestructive assay, feed segregation, and feed and product preparation. The wastes generated from the shipping and receiving function and the materials management function would consist of decontamination solutions, damaged primary containers, lubricants, hydraulic fluids, and process wastewater.

The direct processing steps within the Pu conversion facility would include separation, oxidation/wash and calcination, and repackaging of the oxide products in their final form prior to disposition. The separation function would use aqueous processing, including dissolution, extraction or ion exchange, precipitation, and calcination operations. The oxidation/wash function would consist of oxidizing carbonaceous components in scrap feeds, providing additional size reduction, and leaching Pu from the insoluble residue. The calcination function would convert impure feeds by oxidizing reactive metals and carbonaceous material and stabilizing the material to a uniform size and composition that would meet long-term storage criteria. The repackaging function would entail containerization and interim storage for the oxide products from the recovery processes, as well as for the surplus metal and oxides from existing facilities, in accordance with safe storage criteria.

Waste management involves the collection, assaying, sorting, treating, packaging, storing, and shipping of radioactive, hazardous, and mixed wastes generated by Pu conversion operations, and hazardous and nonhazardous waste from the support facilities. Wastes would be processed to ensure compliance with all applicable Federal and State statutes and regulations and DOE Orders.

For solid waste treatment, initial sorting of wastes would be performed at the source of generation and would involve treatment by a variety of processes to ensure regulatory compliance. Nondestructive assay systems would be provided to assay waste materials for Pu content and certify the waste as low-level or TRU. For liquid waste treatment, solutions from the various process functions would be treated to produce a disposable waste form. Processing capabilities would include: neutralization, filtration, precipitation, concentration by evaporation, immobilization, and packaging/certification for disposal. The radioactive liquid waste would be processed and recycled to the maximum extent possible at the point of generation. Following appropriate treatment to below permitted levels, aqueous wastes would be discharged to natural drainage channels or permitted outfalls.

Any nonradiological wastes generated from operation would be monitored, collected, and treated, if necessary, before discharge to the environment. Facilities would be provided to treat chemically contaminated wastewaters to below regulatory requirements before discharge to the environment. Holding tanks would be provided for the wastes. Nonradioactive solid wastes would be recycled where possible or transferred to approved disposal sites in accordance with accepted industrial practices and regulatory requirements.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater discharges, including cooling system and boiler blowdown, would be treated in an industrial wastewater treatment plant prior to discharge in accordance with applicable environmental standards. The facility design includes a sanitary treatment plant to treat liquid sanitary wastes.

High-Level Waste. The Pu conversion facility would not generate any HLW.

Transuranic Waste. TRU wastes would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes, including those directly supporting surplus Pu conversion and final waste form production, and those managing the various waste streams, would produce used HEPA filters, retired gloveboxes and leaded gloves, glovebox sweepings, failed equipment, contaminated wipes and rags, combustibles, used hydraulic fluids, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

Transuranic wastes would be treated in a waste handling facility to form grout or a compact solid waste. Treated TRU waste products would be packaged, assayed, and certified to meet the waste acceptance criteria of the WIPP or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268 and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A small quantity of solid mixed TRU waste, mainly protective clothing and radiological survey waste, would be generated annually during operations. This mixed TRU waste would be primarily generated from activities at the waste handling/management facilities. Mixed TRU would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act* of 1992. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Numerous processes, including those directly supporting surplus Pu conversion and final waste form production, and those managing the various waste streams, would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration and size reduction processes.

Any liquid LLW would be treated and the remaining LLW sludge would be solidified. Final LLW products would be surveyed and disposed of in an onsite or offsite DOE LLW disposal facility.

Mixed Low-Level Waste. A very small quantity of liquid and solid mixed LLW would be generated annually during operations. Liquid mixed LLW could originate from potentially contaminated lubricants and hydraulic fluids used for material handling equipment. Solid mixed LLW would be made up of wipes laden with contaminated oils and hydraulic fluids. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act* of 1992.

Hazardous Waste. Many of the Pu conversion facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities, lubricants and oils for process and support equipment, and used solvent rags. The liquid and solid hazardous waste would be collected at the facility and stored on an interim basis. The hazardous wastes would be recycled, or stored and packaged for offsite treatment or disposal at commercial RCRA-permitted facilities.

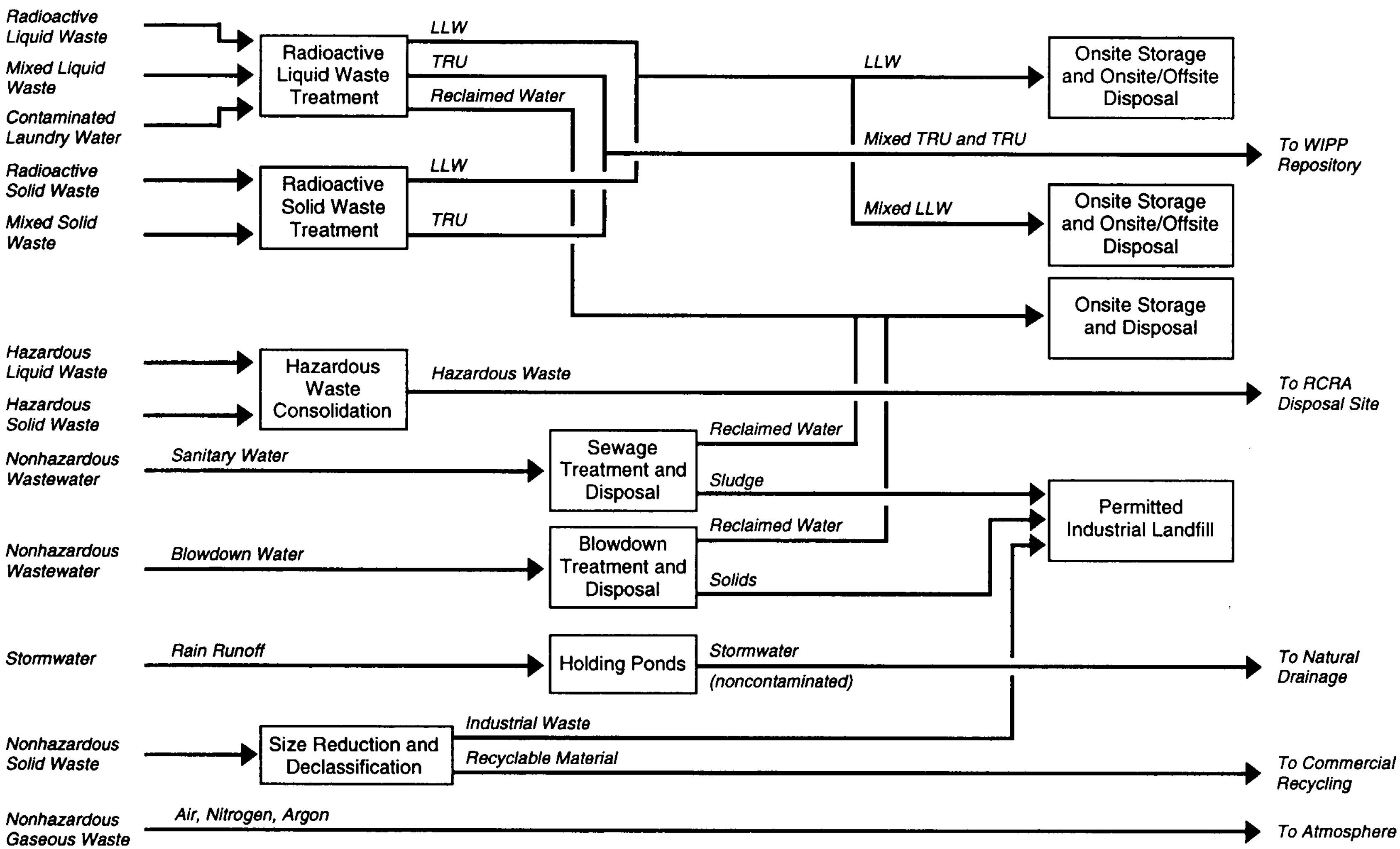
Nonhazardous (Sanitary) Waste. Nonhazardous sanitary liquid wastes generated in the facility would be transferred to the sanitary waste treatment plant for processing. Nonhazardous solid wastes, such as domestic trash, office waste, cafeteria wastes, clean non-Pu wastes, and industrial wastes from utility and maintenance operations, would be hauled to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other nonhazardous liquid wastes generated from facilities support operations (for example, cooling system blowdown and evaporator condensate) would be collected in a catch tank and sampled before being reclaimed for other recycle use or release to the environment. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treatment system. Runoff outside of the main facility area would be discharged directly into the natural drainage channel or river.

Table E.3.2.2–1. Estimated Waste Volumes for Plutonium Conversion Facility

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	3.2[a]	None
Solid	None	278	278
Mixed Transuranic			
Liquid	None	None	None
Solid	None	191	191
Low-Level			
Liquid	None	56[a]	None
Solid	None	1,743	1,743
Mixed Low-Level			
Liquid	None	0.04	None
Solid	None	191	191
Hazardous			
Liquid	24[b]	2	2
Solid	96[b]	11	11
Nonhazardous (Sanitary)			
Liquid	2,360	15,000	15,000
Solid	868[c]	2,060	2,060
Nonhazardous (Other)			
Liquid	Included in sanitary	56	56
Solid	Included in sanitary	None	None

[a] Liquid TRU waste and LLW would be treated with the remaining TRU and low-level sludge being solidified.
[Text deleted.]
[b] Estimated from consolidated special nuclear materials storage facility (DOE 1996e).
[Text deleted.]
[c] Includes 57.5 t of steel using the conversion factor of 0.127 m^3/t.
[Text deleted.]
Source: LANL 1996c.



Source: LANL 1996c.

2716/FMD

Figure E.3.2.2–1. Plutonium Conversion Facility Waste Management Process Flow Diagram.

E.3.2.3 Generic Mixed Oxide Fuel Fabrication Facility

The design of the generic MOX fuel fabrication facility would place great emphasis on the minimization of both liquid and solid wastes. Where generation of a waste could not be avoided, methods would be pursued to recycle the waste. In general terms, the waste management of the generic MOX fuel fabrication facility would include waste handling and treatment operations for processing the various wastes in aqueous, organic liquid, or solid form generated directly from MOX fuel fabrication operations or from related site activities.

Table E.3.2.3–1 presents the estimated annual waste volumes during construction and operation of the generic MOX fuel fabrication facility. Waste management capabilities would be provided to monitor, treat, and handle radioactive, industrial and chemical, and sanitary and stormwater wastes. The treated effluent from utility, process, and sanitary wastewater treatment would be reclaimed to be used as cooling system makeup water.

The fuel fabrication process would consist of the purification and conditioning of plutonium dioxide (PuO_2) that does not meet specifications; blending of PuO_2 and uranium dioxide; fabrication of fuel pellets; fabrication of fuel rods; assembly of fuel bundles; recycling of Pu-bearing scrap and materials from pellets, rods, and bundles that do not meet requirements; and management of wastes generated throughout the fuel fabrication process. The wastes would include TRU, low-level, mixed, hazardous, and nonhazardous wastes. The radioactive and nonradioactive waste management capabilities provided to handle these wastes would be located in the Waste Management Building adjacent to the Receiving and Storage Building and the Fuel Fabrication Building. The waste treatment processes would include assay examination, sorting, separation, concentration, size reduction, special treatment, and thermal treatment. The waste would be converted to either water meeting effluent standards, grouted cement, or compacted solid waste as final form products for disposal. The waste treatment processing would also perform equipment and waste container decontamination operations.

Waste would be generated during each step of the MOX fuel fabrication. As illustrated in Figures E.3.2.3–1 and E.3.2.3–2, the waste management process would involve the collection, assaying, sorting, treating, packaging, storing, and shipping of radioactive, hazardous, and mixed wastes from the Pu operations, and hazardous and nonhazardous wastes from the support facilities. Initial sorting of solid waste would be performed at the generation source. Solid waste would be treated by a variety of processes to ensure compliance with all applicable requirements. The treatment processes include passivation for reactive metals. Waste products would be immobilized and packaged to meet DOT and DOE requirements. Liquid organic waste would be separated and dispositioned, as would solid organic waste. In addition, radioactive liquid waste would be neutralized, filtered, precipitated, concentrated by evaporation, immobilized, and packaged for appropriate disposal, while mixed LLW would be stored until a decision is made to allow disposal as LLW following appropriate treatment. Mixed TRU waste would be handled like other TRU wastes. Finally, solid, nonhazardous, and aqueous and gaseous wastes would be treated in conformance with standard industrial practice and regulatory requirements. Solid nonhazardous waste would either be disposed of in a permitted sanitary landfill or sent to a commercial recycle center. Aqueous waste that was below regulatory limits would be discharged through permitted outfalls. Gaseous waste that was below regulatory limits following treatment would be released to the atmosphere.

All of the nonradioactive waste generated from operation would be strictly monitored, completely collected, and appropriately treated, if necessary, before discharge to the environment. Facilities would be provided to treat chemically-contaminated wastewaters before discharge to the environment. Holding tanks would be provided for the waste. Solid nonradioactive waste would be recycled, where possible, or transferred to approved disposal sites in accordance with accepted industrial practices.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater (including cooling system and boiler blowdown) would be treated in an industrial wastewater treatment plant prior to discharge in accordance with applicable environmental standards. The facility design includes a sanitary treatment plant to treat liquid sanitary waste.

High-Level Waste. The generic MOX fuel fabrication facility would not generate any HLW.

Transuranic Waste. TRU waste would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes, including those directly supporting the Pu oxide purification, MOX fuel fabrication, fuel pellet/rod/bundle handling, material recycle, and those managing the various waste streams, would produce used ventilation air filters, resins, and Pu oxide sweepings, as well as contaminated operator clothing, gloves, glove boxes, tools, wipes and rags, shoe covers, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

The TRU waste would be treated in a waste handling facility to form grout or a compact solid waste. Treated TRU waste products would be packaged, assayed, and certified to meet the waste acceptance criteria of the WIPP or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268 and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste, mainly protective clothing and radiological survey water, would be generated annually during operations. This solid mixed TRU waste would be primarily generated from activities at the Waste Management Building. Mixed TRU waste would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site treatment plan that was developed to comply with the *Federal Facility Compliance Act*. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Numerous processes, including those directly supporting the Pu oxide purification, MOX fuel fabrication, fuel pellet/rod/bundle handling, and material recycling, and those managing the various waste streams, would produce contaminated operator clothing, gloves, tools, wipes and rags, shoe covers, and process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration, and size-reduction processes. Any liquid LLW would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of in a DOE or commercial LLW disposal facility.

Mixed Low-Level Waste. A very small quantity of solid mixed LLW, mainly protective clothing and radiological survey waste, would be generated annually during operations. This mixed LLW would be primarily generated from activities at the Waste Management Building. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site treatment plan that was developed to comply with the *Federal Facility Compliance Act*.

Hazardous Waste. Many of the generic MOX fuel fabrication facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities, and lubricants and oils for process and support equipment. Liquid waste would include cleaning solvents, vacuum pump oils, film processing fluids, hydraulic fluids from mechanical equipment, antifreeze solutions, and paint. Solid waste would include lead packing, used wipes and rags contaminated with oils, lubricants, and cleaning solvents. The liquid and solid hazardous wastes would be collected at the facility and stored on an interim basis. The hazardous waste would be recycled, or stored and packaged for offsite treatment and disposal at commercial RCRA-permitted facilities.

Nonhazardous (Sanitary) Waste. Liquid nonhazardous sanitary waste generated in the facility would be transferred to the sanitary waste system for treatment. Solid nonhazardous waste, such as domestic trash and office waste, would be hauled to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Liquid nonhazardous waste generated from support operations (for example, cooling system blowdown and evaporated condensate) would be collected in a catch tank and sampled before being reclaimed for other recycle use or release to the environment. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treating system. Runoff outside of the main facility area would be discharged directly into the natural drainage channel or river.

Table E.3.2.3–1. Estimated Waste Volumes for the Generic Mixed Oxide Fuel Fabrication Facility

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	None	None
Solid	None	306	306
Mixed Transuranic			
Liquid	None	None	None
Solid	None	4	4
Low-Level			
Liquid	None	4	None
Solid	None	153	153
Mixed Low-Level			
Liquid	None	0.8	None
Solid	None	38	38
Hazardous			
Liquid	13	4	None
Solid	None	153	153
Nonhazardous (Sanitary)			
Liquid	1,890	43,300[a]	43,300[a]
Solid	Included in liquid	76	76
Nonhazardous (Other)			
Liquid	None	227	227
Solid	515[b]	84[c]	76

[a] Includes cooling water blowdown and evaporator condensate.
[b] Includes 44.6 t of steel (assuming 0.127 m^3/t).
[c] Includes 8 m^3 of recyclable wastes.
Source: LANL 1996b.

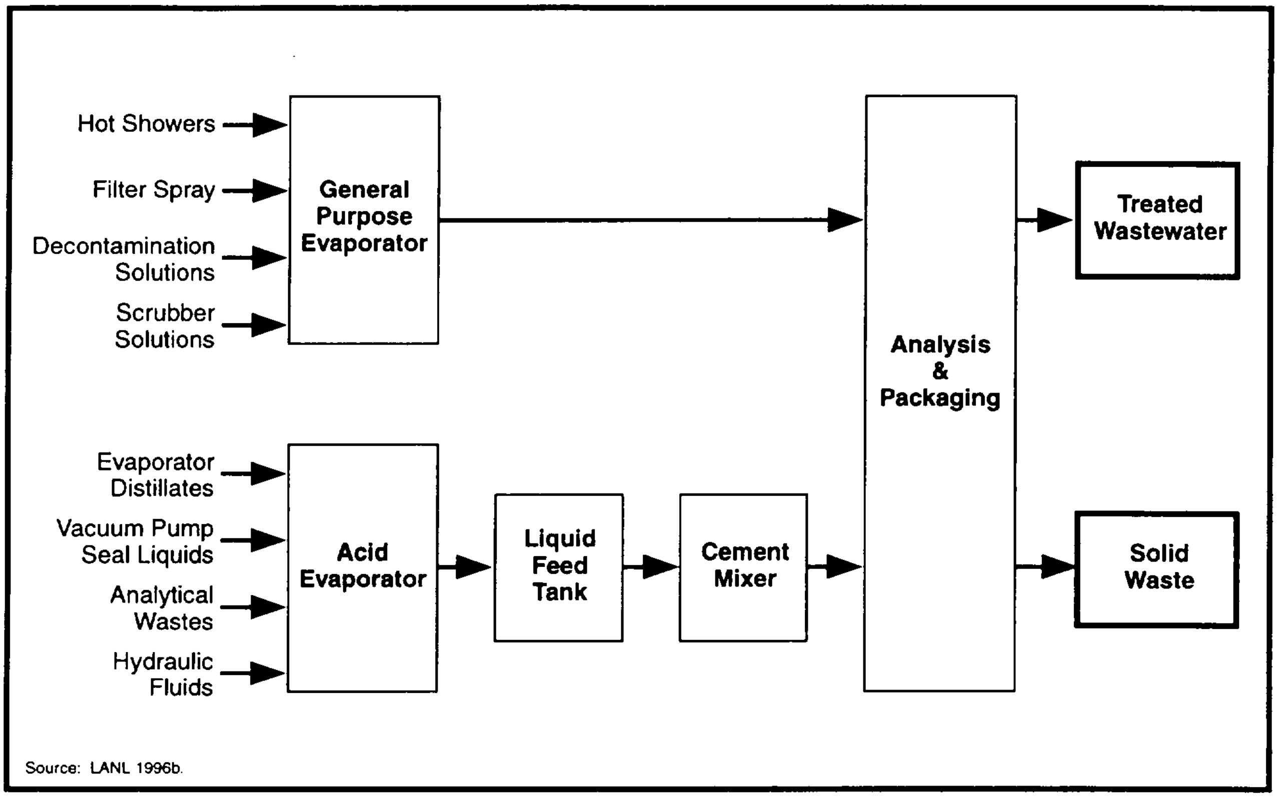


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Figure E.3.2.3–1. Generic Mixed Oxide Fuel Fabrication Facility Liquid Waste Management Process Flow Diagram.

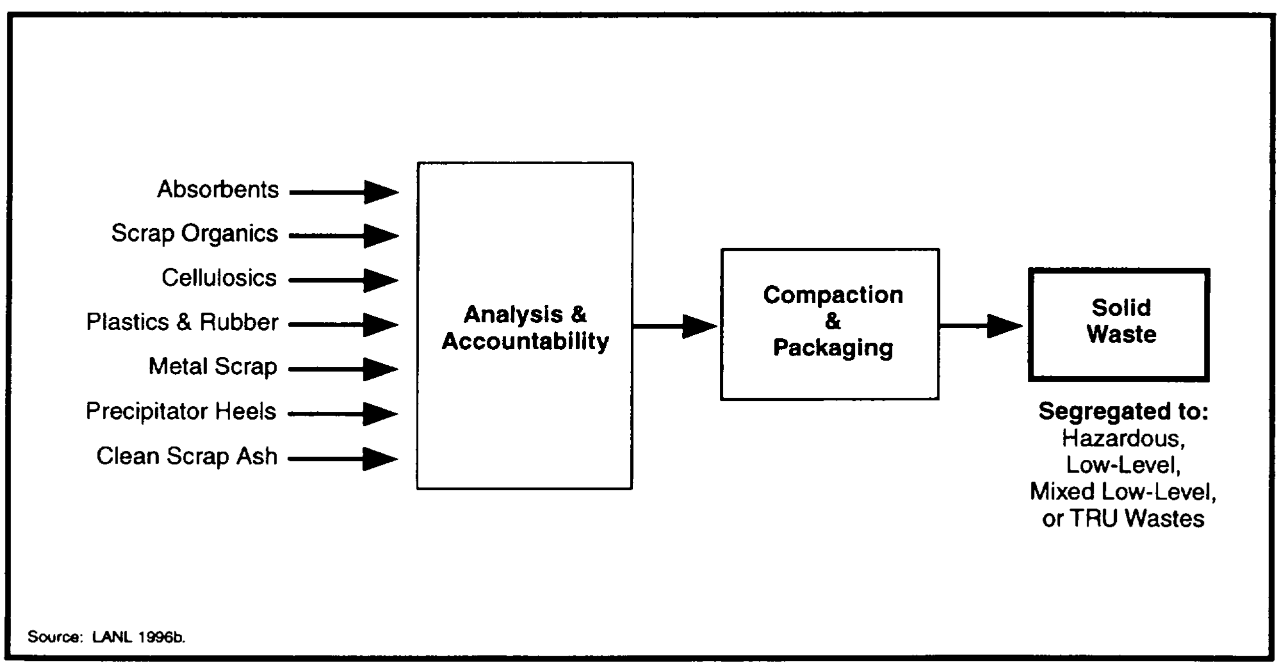

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Figure E.3.2.3–2. Generic Mixed Oxide Fuel Fabrication Facility Solid Waste Management Process Flow Diagram.

E.3.3 FACILITIES TO SUPPORT FINAL DISPOSITION OF PLUTONIUM

Under the Preferred Alternative for surplus Pu disposition, the ceramic immobilization facility or the vitrification facility could be located at Hanford or SRS. The volume of waste generated from the construction of these alternatives could be reduced by existing facilities for portions of the operations. The next tier of NEPA review will examine locations for the second alternatives including the use of existing facilities.

E.3.3.1 Direct Disposition Alternative—Deep Borehole Complex

The design of the deep borehole disposal facility for direct disposition would place great emphasis on the minimization of both liquid and solid wastes. Where generation of waste could not be avoided, methods would be pursued to recycle the waste. In general terms, the waste management of the borehole facility would include waste handling and treatment operations for processing the various wastes (in aqueous, organic liquid, or solid form) generated directly from borehole disposition operations or from related site activities.

Table E.3.3.1–1 presents the estimated annual waste generation volumes during construction and operation of the deep borehole disposal facility. As illustrated in Figure E.3.3.1–1, waste management capabilities would be provided to monitor, treat, and handle radioactive, industrial, and chemical wastes, as well as sanitary and stormwater wastes. The treated effluent from utility, process, and sanitary wastewater treatment would be reclaimed to be used as cooling system makeup water. Generated wastes would include TRU, low-level, mixed, hazardous, and nonhazardous wastes. The management facilities provided to handle radioactive wastes would be located in the Process Waste Management Facility adjacent to the receiving and processing building. The waste treatment processes would include assay examination, sorting, separation, concentration, size reduction, special treatment, and thermal treatment. The wastes would be converted to water meeting effluent standards, grouted cement, or compacted solid waste as final form products for disposal. The waste treatment processing would also perform equipment and waste container decontamination operations.

Any wastes generated by the surface processing facility would be sampled for radioactivity and, if free of contamination, would be stored, pending disposal, in a permitted sanitary/industrial disposal facility. If contaminated, they would be considered low-level/TRU waste and treated accordingly. Solid waste generated from process operations at the surface facilities would include packing materials, deformed Pu shipping containers, wipes and rags, gloves, paper clothing, and HEPA filters. Liquid waste would include wash water from canister decontamination, spent pump oils, and trichloroethane cleaning solvent.

Wastes generated from the drilling facility would include a mixture of solid rock cuttings brought out of the borehole by the drilling mud and drilling mud additives. This conglomeration would be allowed to settle out in the drilling mud pit. The exact makeup of the additives and rock cuttings will not be known until the geology of the site has been ascertained. Once characterized, this cutting mixture would be disposed of by appropriate means. Any wastewater generated by the drilling process would be tested and treated, as needed, through evaporation ponds and the residual solids would be buried in the mud pits.

The Process Waste Management Facility would contain equipment and processes for the treatment of nonhazardous process, hazardous, radioactive, and mixed liquid wastes. The facility would allow treatment of any wastewater generated by the various facilities. The wastewater originating in the borehole array area would be pumped through underground pipes to the Process Waste Treatment Facility. This wastewater would primarily consist of mop waters and cleaning solutions, emplacement canister sealants and additives, drilling mud additives, grout additives, and machine coolant wastes. The drilling facility would generate a substantial amount of wastewater as overflow from drilling mud settlement ponds. In addition, water pumped out of the borehole during drilling, emplacing, and sealing operations would require appropriate treatment.

Any nonradiological wastes generated from operation would be monitored, collected, and treated, if necessary, before being designated as reclaimed water recycle and used as makeup to the cooling system. Facilities would be provided to treat chemically-contaminated wastewaters before discharge to the environment. Holding tanks would be provided for the wastes. Nonradioactive solid wastes would be recycled, where possible, or transferred to approved disposal sites in accordance with accepted industrial practices.

All fire-sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater (including cooling system and boiler blowdown) would be treated in an industrial wastewater treatment plant prior to being designated as reclaimed water recycle. The facility design includes a sanitary treatment plant to treat liquid sanitary wastes.

High-Level Waste. The deep borehole disposal facility for direct disposition would not generate any HLW.

Transuranic Waste. TRU wastes would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes (including those directly supporting the borehole drilling, radioactive Pu handling, and direct canister emplacement and those managing the various waste streams) would produce used ventilation air filters, resins, and sludges, as well as contaminated operator clothing, gloves, wipes, shoe covers, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

Transuranic wastes would be treated in a waste handling facility to form grout or a compact solid waste. The small amount of liquid TRU waste would be treated with the remaining TRU sludge being solidified. Treated TRU waste products would be packaged, assayed, and certified to meet the waste acceptance criteria of the WIPP or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, these wastes would be transported to WIPP for disposal pursuant to the requirements of 40 CFR 191 and 40 CFR 268.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste (mainly protective clothing and radiological survey waste from the waste handling facility) would be generated annually during operations. Mixed TRU would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Numerous processes (including those directly supporting the borehole drilling, radioactive Pu handling, and direct canister emplacement, and those managing the various waste streams) would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration, and size-reduction processes. Any liquid LLW would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of in a shallow land burial site.

Mixed Low-Level Waste. A very small quantity of solid mixed LLW (mainly protective clothing and radiological survey waste from the waste handling facility) would be generated annually during operations. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act.*

Hazardous Waste. Many of the Deep Borehole Disposal Facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities, lubricants and oils for process and support equipment, and used solvent rags contaminated with trichloroethane. The liquid and solid hazardous waste would be collected at the facility and stored on an interim basis. The hazardous waste would be recycled, or stored and packaged for offsite treatment or disposal at RCRA-permitted facilities.

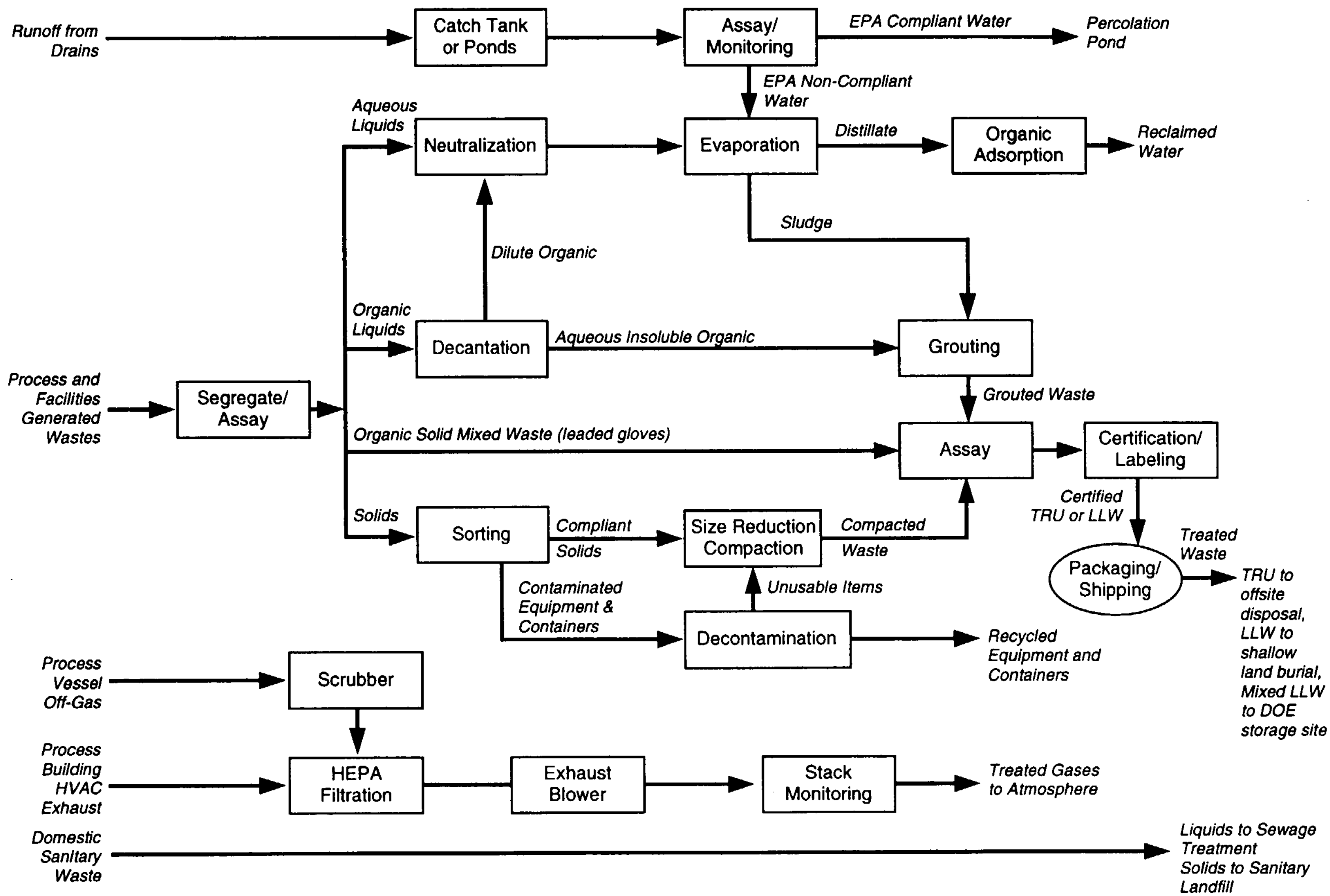
Nonhazardous (Sanitary) Waste. Liquid nonhazardous sanitary waste generated in the facility would be transferred to the sanitary waste system for treatment. Treated wastewater would be designated as reclaimed water recycle and would be used as makeup to the cooling system. Solid nonhazardous waste (such as domestic trash and office waste) would be hauled to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other liquid nonhazardous wastes generated from facilities support operations (for example, cooling system and boiler blowdown) would be collected in a catch tank and sampled before being reclaimed for recycle use, such as makeup to the cooling system. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treatment system. Runoff outside of the main facility area would be discharged directly into the natural drainage channel or river.

Table E.3.3.1–1. Estimated Waste Volumes for the Direct Disposition Alternative—Deep Borehole Complex

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.2[a]	None
Solid	None	0.2	0.2
Mixed Transuranic			
Liquid	None	None	None
Solid	None	0.04	0.04
Low-Level			
Liquid	None	2[a]	None
Solid	None	5	5
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	4	110[b]	110[b]
Solid	26	17[c]	17[c]
Nonhazardous (Sanitary)			
Liquid	10,100	10,600	None[d]
Solid	331	306	306
Nonhazardous (Other)			
Liquid	1,890[e]	6,800[f]	None[d]
Solid	179[g]	1,250[h]	1,250[h]

[a] Liquid TRU waste and LLW would be treated with the remaining TRU and low-level sludge being solidified.
[b] Includes 108 m^3 of oil, antifreeze, and hydraulic fluid.
[c] Includes 1,814 kg (assuming 1,500 kg/m^3) of rags and other materials generated by the Drilling and Emplacing-Borehole Sealing Facilities.
[d] Treated wastewater would be designated as reclaimed water recycle and would be used as makeup to the cooling system.
[e] Includes service water and concrete batch plant water.
[f] Includes cooling water blowdown and evaporator condensate.
[g] Includes 60 t of steel (assuming 0.127 m^3/t).
[h] Includes 38,600 kg (assuming 1,500 kg/m^3) of bentonite and polymers, and 1,220 m^3 of rock cuttings generated by the Drilling and Emplacing-Borehole Sealing Facilities.
Source: LLNL 1996a.



Source: LLNL 1996a.

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Figure E.3.3.1–1. Direct Disposition Alternative—Deep Borehole Complex Disposal Facility Waste Management Process Flow Diagram.

E.3.3.2 Immobilized Disposition Alternative—Deep Borehole Complex

The design of the deep borehole disposal facility for immobilized disposition would place great emphasis on the minimization of both liquid and solid wastes. Where generation of a waste could not be avoided, methods would be pursued to recycle the waste. In general terms, the waste management of the borehole facility would include waste handling and treatment operations for processing the various wastes in aqueous, organic liquid or solid form generated directly from borehole disposition operations or from related site activities.

Table E.3.3.2–1 presents the estimated annual waste volumes during construction and operation of the deep borehole disposal facility. As illustrated in Figure E.3.3.2–1, waste management capabilities would be provided to monitor, treat, and handle radioactive wastes, industrial, and chemical wastes, as well as sanitary and stormwater wastes. The treated effluent from utility, process and sanitary wastewater treatment would be reclaimed to be used as cooling system makeup water. The wastes would include TRU, low-level, mixed, hazardous and nonhazardous wastes. The management facilities provided to handle radioactive wastes would be located in the Process Waste Management Facility adjacent to the receiving and process building. The waste treatment processes would include assay examination, sorting, separation, concentration, size reduction, special treatment, and thermal treatment. The wastes would be converted to either water meeting effluent standards, grouted cement, or compacted solid waste as final form products for disposal. The waste treatment processing would also perform equipment and waste container decontamination operations.

Any wastes generated by the Surface Processing Facility would be sampled for radioactivity and, if free of contamination, would be stored for disposal in a permitted sanitary/industrial disposal facility. If contaminated, they would be considered low-level/TRU waste and treated accordingly. Solid waste generated from process operations at the surface facilities would include packing materials, deformed Pu-loaded ceramic pellet shipping containers, wipes and rags, gloves, paper clothing, and HEPA filters. Liquid waste would include washwater from canister decontamination, spent pump oils, and trichloroethane cleaning solvent.

Wastes generated from the drilling facility would include a mixture of solid rock cuttings brought out of the borehole by the drilling mud and drilling mud additives. This conglomeration would be allowed to settle out in the drilling mud pit. The exact makeup of the additives and rock cuttings will not be known until the geology of the site has been ascertained. Once characterized, this cutting mixture would be disposed of by appropriate means. Any wastewater generated by the drilling process would be tested and treated, as needed, through evaporation ponds and the residual solids would be buried in the mud pits.

The Process Waste Management Facility would contain equipment and processes for the treatment of nonhazardous process, hazardous, radioactive, and mixed liquid wastes. The facility would allow treatment of any wastewater generated by the Surface Processing Facility and Pellet-Grout Mix Preparation Subfacility, as well as the Emplacing-Borehole Sealing Facility processes. The wastewater originating in the borehole array area would be pumped through underground pipes to the Process Waste Treatment Facility. This wastewater would primarily consist of mopwaters and cleaning solutions, emplacement canister sealants and additives, drilling mud additives, grout additives, and machine coolant wastes. The drilling facility would generate a substantial amount of wastewater as overflow from drilling mud settlement ponds. In addition, water pumped out of the borehole during drilling, emplacing, and sealing operations would require appropriate treatment.

Any nonradiological wastes generated from operation would be monitored, collected, and treated, if necessary, before being designated as reclaimed water recycle and used as makeup to the cooling system. Facilities would be provided to treat chemically-contaminated wastewaters before discharge to the environment. Holding tanks would be provided for the wastes. Nonradioactive solid wastes would be recycled, where possible, or transferred to approved disposal sites in accordance with accepted industrial practices.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled and if required, retained until disposal. Utility wastewater discharges (including cooling system and boiler blowdown) would be treated in an industrial wastewater treatment plant prior to being designated reclaimed water recycle. The facility design includes a sanitary treatment plant to treat liquid sanitary wastes.

High-Level Waste. The deep borehole disposal facility would not generate any HLW.

Transuranic Waste. TRU wastes would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes, including those directly supporting the borehole drilling, radioactive Pu handling, and direct canister emplacement, and those managing the various waste streams, would produce used ventilation air filters, resins, and sludges, as well as contaminated operator clothing, gloves, wipes, shoe covers, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

The TRU wastes would be treated in a waste handling facility to form grout or a compact solid waste. The small amount of liquid TRU waste would be treated with the remaining TRU sludge being solidified. Treated TRU waste products would be packaged, assayed, and certified to meet the waste acceptance criteria of the WIPP or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. Mixed TRU would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Numerous processes, including those directly supporting the borehole drilling, radioactive Pu handling, and direct canister emplacement, and those managing the various waste streams, would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. Following characterization, these wastes would be handled, treated and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration and size-reduction processes. Any liquid LLW would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of in a shallow land burial site.

Mixed Low-Level Waste. A very small quantity of solid mixed LLW, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*.

Hazardous Waste. Many of the deep borehole disposal facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities, lubricants and oils for process and support equipment, and used solvent rags contaminated with trichloroethane. The liquid and solid hazardous waste would be collected at the facility and stored on an interim basis. The hazardous wastes would be recycled, or stored and packaged for offsite treatment or disposal at commercial RCRA-permitted facilities.

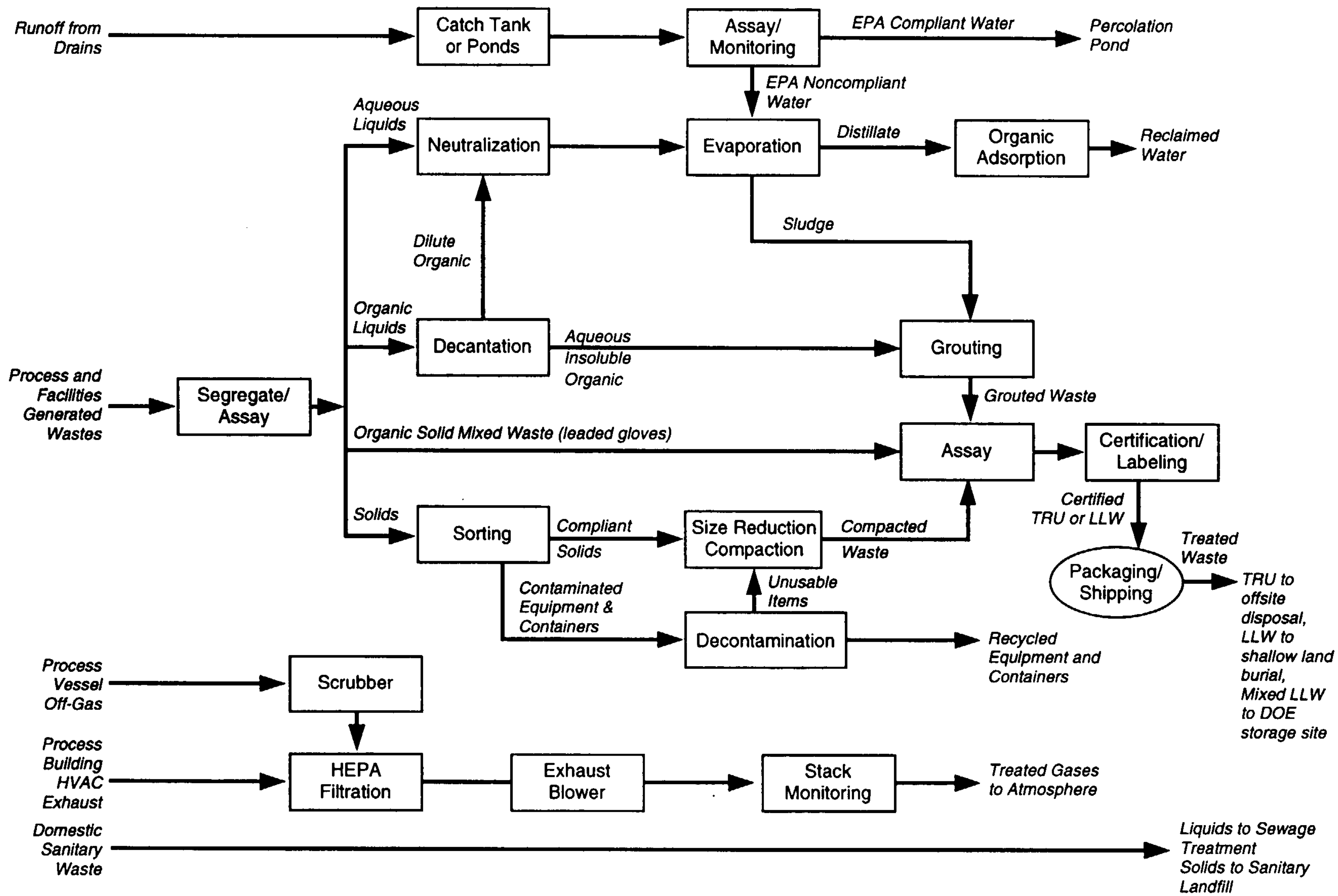
Nonhazardous (Sanitary) Waste. Nonhazardous sanitary liquid wastes generated in the facility would be transferred to the sanitary waste system for treatment. Treated wastewater would be designated as reclaimed water recycle and would be used as makeup to the cooling system. Nonhazardous solid wastes, such as domestic trash and office waste, would be hauled to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other nonhazardous liquid wastes generated from facility support operations (for example, cooling system and evaporator condensate) would be collected in a catch tank and sampled before being reclaimed for recycle use such as make up water to the cooling system. Solid wastes would include rock cuttings from the boreholes and bentonite and polymers generated by the Drilling and Emplacing-Borehole Sealing Facilities. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treatment system. Runoff outside of the main facility area would be discharged directly into the natural drainage channel or river.

Table E.3.3.2–1. Estimated Waste Volumes for the Immobilized Disposition Alternative—Deep Borehole Complex

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.5[a]	None
Solid	None	0.5	0.5
Mixed Transuranic			
Liquid	None	None	None
Solid	None	0.1	0.1
Low-Level			
Liquid	None	3[a]	None
Solid	None	6	5
Mixed Low-Level			
Liquid	None	None	None
Solid	None	None	None
Hazardous			
Liquid	4	141[b]	141[b]
Solid	24	15[c]	15[c]
Nonhazardous (Sanitary)			
Liquid	10,700	9,460	None[d]
Solid	306	291	291
Nonhazardous (Other)			
Liquid	1,770[e]	6,060[f]	None[d]
Solid	162[g]	1,250[h]	1,250[h]

[a] Liquid TRU waste and LLW would be treated with the remaining TRU and low-level sludge being solidified.
[b] Includes 69.6 m^3 of decontamination water and 69.6 m^3 of oil, antifreeze, and hydraulic fluid.
[c] Includes 1,090 kg (assuming 1,500 kg/m^3) of rags and other materials generated by the Drilling and Emplacing-Borehole Sealing Facilities.
[d] Treated wastewater would be designated as reclaimed water recycle and would be used as makeup to the cooling system.
[e] Includes service water and concrete batch plant water.
[f] Includes cooling water blowdown and evaporator condensate.
[g] Includes 54 t of steel (assuming 0.127 m^3/t).
[h] Includes 38,550 kg (assuming 1,500 kg/m^3) of bentonite and polymers, and 1,220 m^3 of rock cuttings generated by the Drilling and Emplacing-Borehole Sealing Facilities.
Source: LLNL 1996h.



Source: LLNL 1996h.

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Figure E.3.3.2–1. Immobilized Disposition Alternative—Deep Borehole Complex Disposal Facility Waste Management Process Flow Diagram.

E.3.3.3 Immobilized Disposition Alternative—Ceramic Immobilization Facility

The ceramic immobilization facility using coated pellets without radionuclides includes a scrap treatment cell to allow treatment of off-specification process materials, contaminated equipment, and components to recover Pu and recycle it back into the calcination and pellet press process. The cell would be equipped with equipment suitable for size reduction and process feed makeup of off-specification ceramic material from the pellet pressing and coating operations. Decontamination and leaching equipment also would be provided to allow recovery of Pu from process equipment and to return the solutions to the calciner feed makeup process. Other off-specification materials from the process upstream of the pellet presses would be recycled to the appropriate equipment in the Pu process. The ceramic immobilization operations would be configured with minimization of waste products given high priority.

Table E.3.3.3–1 presents the estimated annual waste volumes during construction and operation of the ceramic immobilization facility. As illustrated in Figure E.3.3.3–1, waste management facilities would be provided to monitor, treat, and handle radioactive wastes, including LLW, TRU waste, and mixed waste. These management facilities would be located in the Radwaste Management Building immediately adjacent to the Plutonium Processing Building. The waste treatment processes include assay examination, sorting, separation, concentration, size reduction, organic destruction, and thermal treatment.

Process liquid radioactive waste treatment facilities include the nitric acid recovery system and the LLW/TRU radwaste solidification systems. Since these systems would handle relatively low-activity waste streams, they generally would be located in processing areas outside the main Pu processing areas. The nitric acid and water would be recovered and recycled wherever appropriate for reuse in the facility. Low-level liquid radwaste treatment systems generally would be located in nonshielded processing rooms equipped with room ventilation confinement zoning appropriate to the expected levels of contamination within the room. Mixed waste would be segregated from other waste forms, and stored for onsite or offsite treatment treatment in accordance with the site treatment plan.

Process solid radioactive waste treatment would also be performed in the Radwaste Management Building. Solid waste generated from glovebox operations for the Pu processing head end generally would be handled and processed in glovebox enclosures. Where fume or dust generation is anticipated, equipment would be installed in glovebox enclosures supplied with local filters, mist eliminators, condensers, and so forth, as required to minimize the spread of contamination to the glovebox ventilation system. Solid waste generated within the process cells would be segregated remotely into low-level contact-handled, low-level remote-handled, TRU, and mixed waste. Solid waste assay, segregation, decontamination, and volume-reduction facilities would be used to minimize the volume of waste shipped from the facility. Waste packaging and shipping facilities for both LLW and TRU waste would be provided.

Gaseous waste would be filtered, condensed, scrubbed, absorbed, and so forth, as required to meet DOE and other applicable regulatory requirements. Local condensers, mist eliminators, and sintered-metal filters with blowback to the process are intended for Pu oxidation, calcination, hot pressing, and other operations where particulate generation is expected. HEPA filters would be provided at both inlets and outlets of glovebox enclosures handling Pu.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater discharges (including cooling system and boiler blowdown, cold chemical area liquid effluents, and nonradioactive liquid ceramic additive liquid wastes) would be treated in an industrial wastewater treatment plant prior to discharge in accordance with applicable environmental standards. The facility design includes a sanitary treatment plant to treat liquid sanitary wastes.

High-Level Waste. The ceramic immobilization facility would not generate a HLW stream from processing Pu. However, the facility would produce an immobilized ceramic product. The Pu disposition mission would produce 980 drums annually (LLNL 1996e:9-2). This immobilized ceramic product would require interim storage with final disposal at the deep borehole complex.

Transuranic Waste. TRU wastes would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. The granulation, pellet pressing, pellet sintering, and drum handling functions would generate both liquid and solid TRU waste. The contaminated water from the drum decontamination would be collected and transferred to the recycle waste evaporator.

Numerous other processes, including those directly supporting the production of radioactive ceramic and those managing the various waste streams, would produce used ventilation air filters, as well as contaminated operator clothing, gloves, wipes, shoe covers, and other process equipment. The original containers and packaging associated with the Pu feed would be considered waste and would be subject to characterization. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

The TRU wastes would be treated in a waste handling facility to form grout or compact solid waste. Any liquid TRU waste would be treated with the remaining TRU sludge being solidified. Treated waste products would be packaged, assayed, and certified to meet the WIPP waste acceptance criteria or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste, mainly rubber gloves and leaded glovebox gloves from the waste handling facility, would be generated annually during operations. This mixed TRU waste would be placed in temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*. This mixed TRU waste would need eventual treatment to meet the WIPP waste acceptance criteria.

Low-Level Waste. [Text deleted.] Processes directly supporting the radioactive coated ceramic pellet production, as well as those managing the various waste streams, would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. The original containers and packaging associated with the Pu feed would be considered waste and would be subject to characterization. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration, and size reduction processes. Any liquid LLW would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of in a shallow land burial site.

Mixed Low-Level Waste. A very small quantity of solid mixed LLW, mainly rubber gloves and leaded glovebox gloves from the waste handling facility, would be generated annually during operation of the ceramic immobilization facility. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment to another DOE facility for treatment in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*.

Hazardous Waste. Many of the ceramic immobilization facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities, and lubricants and oils for process and support equipment. The liquid and solid hazardous waste would be collected at the facility and stored on an interim basis. The hazardous wastes would be recycled, or stored and packaged for offsite treatment and disposal at commercial RCRA-permitted facilities.

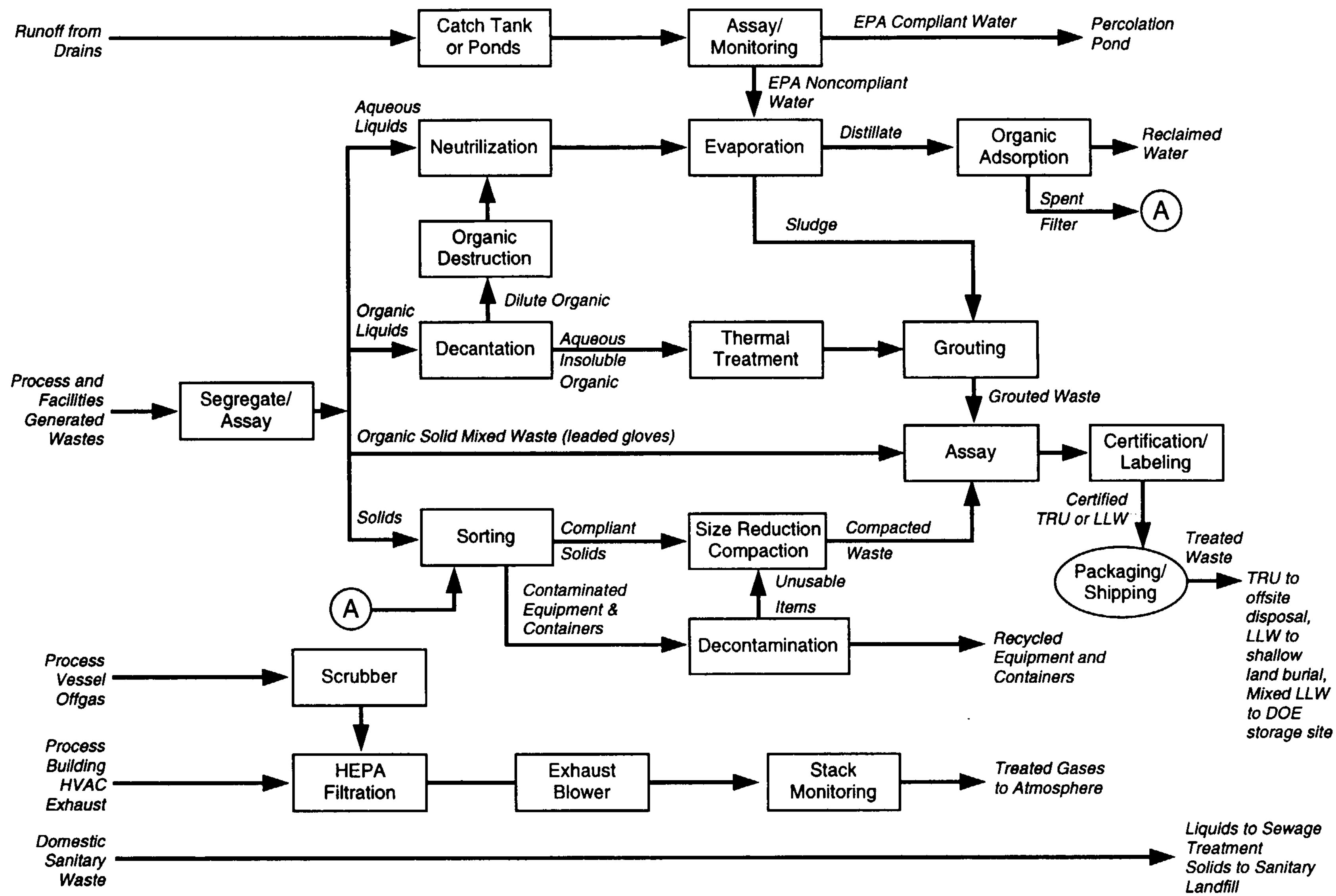
Nonhazardous (Sanitary) Waste. Nonhazardous sanitary liquid wastes generated in the facility would be transferred to a sanitary waste system for treatment. Nonhazardous solid wastes, such as domestic trash and office waste, would be hauled to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other nonhazardous liquid wastes generated from facilities support operations (for example, cooling system blowdown and evaporator condensate) would be collected in a catch tank and sampled before being reclaimed for recycle use or release to the environment. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treatment system. Runoff outside of the main facility area would be discharged directly into the natural drainage channels or river.

Table E.3.3.3–1. Estimated Waste Volumes for the Immobilized Disposition Alternative—Ceramic Immobilization Facility

Category	Annual Average Volume Generated From Construction (m^3)	Annual Average Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	110[a]	None
Solid	None	150	150
Mixed Transuranic			
Liquid	None	None	None
Solid	None	1.5	1.5
Low-Level			
Liquid	None	10[a]	None
Solid	None	23	15
Mixed Low-Level			
Liquid	None	None	None
Solid	None	0.3	0.3
Hazardous			
Liquid	17	45	45
Solid	24	23	23
Nonhazardous (Sanitary)			
Liquid	22,000[b]	43,000[b]	43,000[b]
Solid	Included in liquid	910	910
Nonhazardous (Other)			
Liquid	227,600[c]	186,900[d]	186,900[d]
Solid	147[e]	15[f]	None

[a] Liquid TRU waste and LLW would be treated with the remaining TRU and low-level sludge being solidified.
[b] Includes sewage and industrial wastewater.
[c] Includes service water, concrete batch plant water, and stormwater runoff.
[d] Includes cooling water blowdown, process wastewater, and stormwater runoff.
[e] Includes 220 t of construction material (assuming 1,500 kg/m^3).
[f] Recyclable wastes.
Source: LLNL 1996e.



Source: LLNL 1996e.

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Figure E.3.3.3–1. Immobilized Disposition Alternative—Ceramic Immobilization Facility Waste Management Process Flow Diagram.

E.3.3.4 Vitrification Alternative

The design of the vitrification facility with radionuclides would place great emphasis on the minimization of both liquid and solid wastes. Where generation of a waste could not be avoided, methods would be pursued to recycle the waste. The facility would have a remote decontamination and equipment maintenance facility that would generate contaminated liquid waste. Small amounts of liquid waste would also be generated in the vitrification process from offgas condensate and canister decontamination. These liquid wastes would be evaporated, calcined, and recycled to the melter feed in the form of calcine. Generally, failed contaminated equipment would be decontaminated, then disposed of through appropriate means. Equipment that fails during the life of the facility and could not be decontaminated, repaired, or disposed of would be stored in a failed equipment storage vault beneath the process cells. Because Pu oxide residues may become embedded in the equipment sent to the failed equipment storage vault, all equipment would have a critical safety evaluation prior to storage. The vault would be appropriately shielded to comply with radiological safety criteria. The failed equipment would be disposed of through appropriate means following the end of the operating mission.

Table E.3.3.4–1 presents the estimated annual waste volumes during construction and operation of the vitrification facility. As illustrated in Figure E.3.3.4–1, waste management capabilities would be provided to monitor, treat, and handle radioactive wastes, industrial and chemical wastes, as well as sanitary and stormwater wastes. The wastes would include TRU, low-level, mixed, hazardous, and nonhazardous. The management facilities provided to handle the radioactive wastes would be located in the Radwaste Management Building adjacent to the Vitrification Building. The waste treatment processes include assay examination, sorting, separation, concentration, size reduction, organic destruction, and thermal treatment.

Process liquid radioactive wastes generated by the vitrification facility would be collected in a drain waste collection tank. Most of this waste would be rinsewater streams, process cell sumps, flushing wastes, and condensate from the preparation of Pu-glass frit, cesium nitrate salt, and final vitrification processes. Some radioactive wastes would also be generated from chemical solutions and rinses used in the decontamination of process and maintenance equipment in the decontamination cell or Analytical Laboratory. There would be no discharge of radioactive liquid wastes to the environment. Contents of the drain waste collection tank would be recovered through reprocessing or would be treated in the Radwaste Management Building. Contaminated water would be used to make concrete for the disposal of chlorides from the CsCl process. Any mixed waste would be segregated from other waste forms and stored for offsite or onsite treatment in accordance with the site treatment plan.

Process solid radioactive waste treatment would also be performed in the Radwaste Management Building. Solid wastes generated would include spent canisters and hulls from shipment of Cs-137, chloride-containing cement from the processing of CsCl, contamination control waste, maintenance residues, dust-stop and HEPA filters, and stainless steel Pu-glass frit transfer cans. The solid waste would be controlled at the source of generation to reduce or eliminate this waste whenever possible. The waste would be handled and treated according to the type and concentration of the contamination. Solid waste would be decontaminated to the extent practical in or near the work area and would then be packaged in sealable carbon steel or cardboard containers in the Radwaste Management Building and prepared for disposal. Waste packaging and shipping facilities for both LLW and TRU waste would be provided.

Gaseous wastes generated by operations would include process vessel offgases and heating, ventilation, and air conditioning exhausts. Prior to release to the stack, these gaseous wastes would be filtered, condensed, scrubbed, absorbed, neutralized, and so forth, as required to meet DOE and other applicable regulatory requirements. Local condensers, mist eliminators, and sintered-metal filters with blowback to the process would be provided to ensure no uncontrolled release to the environment. Ventilation air and gaseous effluents from the process cells, process vessels, and melters would be contaminated with process radioactivity. These gases would be treated before discharge to the atmosphere through stacks to ensure that the concentration of radionuclides is at acceptable levels.

Any nonradiological waste generated from operation would be monitored, collected, and treated, if necessary, before discharge to the environment. Facilities would be provided to treat chemically-contaminated wastewaters before discharge to the environment. Holding tanks would be provided for the waste. Solid nonradioactive waste would be recycled, where possible, or transferred to approved disposal sites in accordance with accepted industrial practices.

All fire sprinkler water discharged in process areas during and after a fire would be contained, monitored, sampled, and if required, retained until disposal. Utility wastewater (including cooling system and boiler blowdown) would be treated in an industrial wastewater treatment plant prior to discharge in accordance with applicable environmental standards. The facility design includes a sanitary treatment plant to treat liquid sanitary waste.

High-Level Waste. The vitrification facility would not generate a HLW stream from processing Pu. However, the facility would produce a glass log. The Pu disposition would produce 60 canisters annually (LLNL 1996c:9-3). The glass logs would require interim storage until a final disposal option becomes available.

Transuranic Waste. TRU waste would be generated from process and facility operations, equipment decontamination, failed equipment, and used tools. Numerous processes, including those directly supporting the radioactive Pu-glass frit production, and those managing the various waste streams, would produce used ventilation air filters, resins, and sludges, as well as contaminated operator clothing, gloves, wipes, shoe covers, and other process equipment. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as TRU waste, they would be appropriately treated and stored until final disposal.

The TRU waste would be treated in a waste handling facility to form grout or a compact solid waste. The small amount of liquid TRU waste would be treated with the remaining TRU sludge being solidified. Treated TRU waste products would be packaged, assayed, and certified to meet WIPP waste acceptance criteria or alternative treatment level. Assuming WIPP is determined to be a suitable repository for these wastes and depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes would be transported to WIPP for disposal.

Mixed Transuranic Waste. A very small quantity of solid mixed TRU waste, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. This mixed TRU waste would be generated primarily from activities at the waste handling facilities. Mixed TRU waste would be packaged and shipped to another DOE waste management facility for temporary storage, pending final treatment and disposal in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act*. Current plans call for disposal at WIPP.

Low-Level Waste. [Text deleted.] Cesium capsule processing would produce both liquid and solid LLW. Conducted in a shielded cell with manipulators, the cesium processing involves one capsule at a time. The outer capsule is cut open, decontaminated, and discarded as solid LLW. The inner capsule is sheared to expose the cesium and barium chloride solids. The sheared pieces would be leached in hot water and agitated to dissolve the solid salts. The solution would then be transferred to the ion exchange feed tank, and the capsule hull would be decontaminated and disposed of as LLW. The chloride solution would then be processed using a cation exchange column to isolate the radioactive cesium. The effluent from the exchange column would be recycled to the column as necessary to remove residual cesium. The effluent would then be neutralized and sent to waste treatment for solidification as LLW.

Numerous processes, including those directly supporting the radioactive Pu-glass frit production and those managing the various waste streams, would produce contaminated operator clothing, gloves, wipes, shoe covers, and process equipment. A substantial source of LLW would be the stainless steel cans used to transfer the Pu-glass frit to the blend cell, as they would be decontaminated and discarded as LLW. Following characterization, these wastes would be handled, treated, and disposed of according to their level of contamination. If characterized as LLW, they would be treated by sorting, separation, concentration, and size reduction processes. Any liquid LLW would be treated with the remaining LLW sludge being solidified. Final LLW products would be surveyed and disposed of in a shallow land burial site.

Mixed Low-Level Waste. A very small quantity of solid mixed LLW, mainly protective clothing and radiological survey waste from the waste handling facility, would be generated annually during operations. Any mixed LLW would be stored onsite on an interim basis until treatment, disposal, or offsite shipment in accordance with the site-specific treatment plan that was developed to comply with the *Federal Facility Compliance Act.*

Hazardous Waste. Many of the vitrification facility processes would generate hazardous waste. This waste would include chemical makeup and reagents for support activities; lubricants and oils for process and support equipment; and used solvent rags contaminated with methylene chloride, acetonitrile, and acetone. The liquid and solid hazardous wastes would be collected at the facility and stored on an interim basis. The hazardous waste would be recycled or stored and packaged for offsite treatment or disposal at an RCRA-permitted facility.

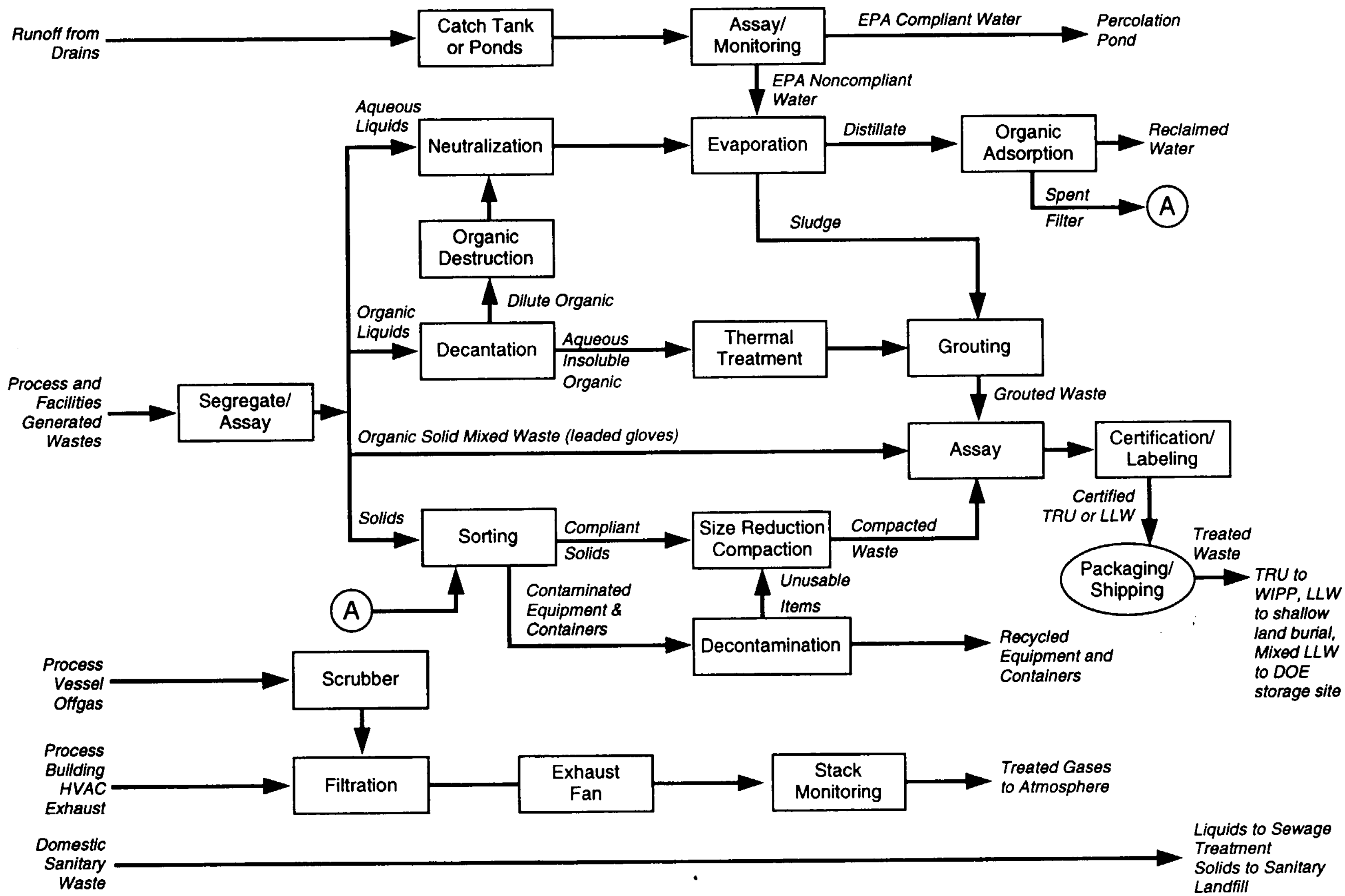
Nonhazardous (Sanitary) Waste. Liquid nonhazardous sanitary waste generated in the facility would be transferred to a sanitary waste system for treatment. Solid nonhazardous waste, such as domestic trash and office waste, would be transported to a permitted sanitary landfill for disposal.

Nonhazardous (Other) Waste. Other liquid nonhazardous waste generated from facility support operations (for example, cooling system blowdown and evaporator condensate) would be collected in a catch tank and sampled before being reclaimed for recycle use or release to the environment. The facility design includes stormwater retention ponds with the necessary NPDES monitoring equipment. Runoff within the main facility area would be collected separately, routed to the stormwater collection ponds, and then sampled and analyzed before discharge to the natural drainage channels (dry site) or river (wet site). If the runoff was contaminated, it would be treated in the process wastewater treating system. Runoff outside of the main facility area would be discharged directly into the natural drainage channels or river.

Table E.3.3.4–1. Estimated Waste Volumes for the Vitrification Alternative

Category	Annual Average Volume Generated From Construction (m^3)	Annual Volume Generated From Operations (m^3)	Annual Volume Effluent From Operations (m^3)
Transuranic			
Liquid	None	0.8[a]	None
Solid	None	99	99
Mixed Transuranic			
Liquid	None	None	None
Solid	None	0.7	0.7
Low-Level			
Liquid	None	7[a]	None
Solid	None	14	14
Mixed Low-Level			
Liquid	None	None	None
Solid	None	0.15	0.15
Hazardous			
Liquid	0.6	19	4
Solid	3	19	19
Nonhazardous (Sanitary)			
Liquid	4,600	34,000[b]	34,000[b]
Solid	76	920	920
Nonhazardous (Other)			
Liquid	380[c]	269,000[d]	269,000[d]
Solid	18[e]	15[f]	None

[a] Liquid TRU waste and LLW would be treated with the remaining TRU and low-level sludge being solidified.
[b] Includes sewage and industrial wastewater.
[c] Includes service water, concrete batch plant water, and stormwater runoff.
[d] Includes cooling water blowdown, process wastewater, and stormwater runoff.
[e] Includes 18.2 t of steel (assuming 0.127 m^3/t).
[f] Recyclable wastes.
Source: LLNL 1996c.



Source: LLNL 1996c.

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Figure E.3.3.4–1. Vitrification Alternative—Vitrification Facility Waste Management Process Flow Diagram.