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Information Related to Low-Level Mixed Waste Inventory, Characteristics, Generation, and Facility Assessment for Treatment, Storage, and Disposal Alternatives Considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement

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NOTATION

The following is a list of acronyms and abbreviations (including site names, elements and compounds, and units of measure) used in this document. Some acronyms used only in tables are defined in those tables.

ACRONYMS AND ABBREVIATIONS

General

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CH	contact-handled
DOE	U.S. Department of Energy
DST	double-shell tank
EPA	U.S. Environmental Protection Agency
FY	fiscal year
GDP	gaseous diffusion plant
HEPA	high efficiency particulate air (filter)
HLW	high-level waste
IDB	*Integrated Data Base*
LLMW	low-level mixed waste
LLW	low-level waste
MWIR-2	*Mixed Waste Inventory Report* (1994)
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
ODS	open, dump, and sort
PM_{10}	particulate matter with a mean diameter ≤10 μm
RCRA	Resource Conservation and Recovery Act
RH	remote-handled
SST	single-shell tank
TCLP	toxicity characteristic leaching procedure
TRUW	transuranic waste
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
USC	*United States Code*
WM	waste management
WMIS	*Waste Management Information System*
WM PEIS	*Office of Waste Management Programmatic Environmental Impact Statement*

Site Names

Ames	Ames Laboratory (Iowa)
ANL-E	Argonne National Laboratory-East (Illinois)
ANL-W	Argonne National Laboratory-West (Idaho)
BCL	Battelle Columbus Laboratories (Ohio)
Bettis	Bettis Atomic Power Laboratory (Pennsylvania)

Site Names (Cont.)

BNL	Brookhaven National Laboratory (New York)
Charleston	Charleston Naval Shipyard (South Carolina)
Colonie	Colonie Site (New York)
ETEC	Energy Technology Engineering Center (California)
FEMP	Fernald Environmental Management Project (Ohio)
Fermi	Fermi National Accelerator Laboratory (Illinois)
GA	General Atomics (California)
GE	General Electric Vallecitos Nuclear Center (California)
GJPO	Grand Junction Projects Office (Colorado)
Hanford	Hanford Site (Washington)
INEL	Idaho National Engineering Laboratory (Idaho)
ITRI	Inhalation Toxicology Research Institute (New Mexico)
K-25	K-25 Site (ORR) (Tennessee)
KAPL-K	Knolls Atomic Power Laboratory (Kesselring) (New York)
KAPL-S	Knolls Atomic Power Laboratory (Schenectady) (New York)
KAPL-W	Knolls Atomic Power Laboratory (Windsor) (Connecticut)
KCP	Kansas City Plant (Missouri)
LANL	Los Alamos National Laboratory (New Mexico)
LBL	Lawrence Berkeley National Laboratory (California)
LEHR	Laboratory for Energy-Related Health Research (California)
LLNL	Lawrence Livermore National Laboratory (California)
Mare Is	Mare Island Naval Shipyard (California)
Middlesex	Middlesex Sampling Plant (New Jersey)
Mound	Mound Plant (Ohio)
Norfolk	Norfolk Naval Shipyard (Virginia)
NTS	Nevada Test Site (Nevada)
ORNL	Oak Ridge National Laboratory (ORR) (Tennessee)
ORR	Oak Ridge Reservation (Tennessee)
Pantex	Pantex Plant (Texas)
Pearl H	Pearl Harbor Naval Shipyard (Hawaii)
PGDP	Paducah Gaseous Diffusion Plant (Kentucky)
Pinellas	Pinellas Plant (Florida)
PORTS	Portsmouth Gaseous Diffusion Plant (Ohio)
Ports Nav	Portsmouth Naval Shipyard (Maine)
PPPL	Princeton Plasma Physics Laboratory (New Jersey)
Puget So	Puget Sound Naval Shipyard (Washington)
RFETS	Rocky Flats Environmental Technology Site (Colorado)
RMI	Reactive Metals, Inc. (Ohio)
Site A	Site A (Illinois)
SLAC	Stanford Linear Accelerator Center (California)
SNL-CA	Sandia National Laboratory (California)
SNL-NM	Sandia National Laboratories (New Mexico)
SRS	Savannah River Site (South Carolina)
UofMO	University of Missouri (Missouri)
WSSR	Weldon Spring Remedial Action Project (Missouri)
WVDP	West Valley Demonstration Project (New York)
Y-12	Y-12 Site (ORR) (Tennessee)

Elements and Compounds

Ac	actinium
Am	americium
Ba	barium
Bi	bismuth
Cm	curium
Co	cobalt
CO	carbon monoxide
Cs	cesium
Eu	europium
Fe	iron
H-3	tritium
HC	hydrocarbon
HCl	hydrogen chloride
Hg	mercury
Mn	manganese
Nb	niobium
Ni	nickel
NO_x	nitrogen oxides
Pa	protactinium
Pb	lead
PCB	polychlorinated biphenyl
Pm	promethium
Po	polonium
Pu	plutonium
Ra	radium
Sb	antimony
Sm	samarium
SO_x	sulfur oxides
Sr	strontium
Tc	technetium
Te	tellurium
Th	thorium
Tl	thallium
U	uranium
Y	yttrium
Zn	zinc

UNITS OF MEASURE

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
Btu	British thermal unit(s)
Ci	curie(s)
cm	centimeter(s)
cm^3	cubic centimeter(s)
d	day(s)
ft^3	cubic foot (feet)
g	gram(s)
gal	gallon(s)
h	hour(s)
in.	inch(es)
kg	kilogram(s)
L	liter(s)
lb	pound(s)
m	meter(s)
m^3	cubic meter(s)
MBtu	million Btu
mg	milligram(s)
min	minute(s)
mrem	millirem(s)
nCi	nanocurie(s)
pCi	picocurie(s)
ppm	part(s) per million
t	metric ton(s)
yr	year(s)

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ABSTRACT

This report was prepared to support the analysis of risks and costs associated with the proposed treatment of low-level mixed waste (LLMW) under management of the U.S. Department of Energy (DOE). The various waste management alternatives for treatment of LLMW have been defined in the DOE's *Office of Waste Management Programmatic Environmental Impact Statement.*

This technical memorandum estimates the waste material throughput expected at each proposed LLMW treatment facility and analyzes potential radiological and chemical releases at each DOE site resulting from treatment of these wastes. Models have been developed to generate site-dependent radiological profiles and waste-stream-dependent chemical profiles for these wastes. Current site-dependent inventories and estimates for future generation of LLMW have been obtained from DOE's 1994 *Mixed Waste Inventory Report* (MWIR-2). Using treatment procedures developed by the Mixed Waste Treatment Project, the MWIR-2 database was analyzed to provide waste throughput and emission estimates for each of the different waste types assessed in this report. Uncertainties in the estimates at each site are discussed for waste material throughputs and radiological and chemical releases.

1 INTRODUCTION

This report provides technical support information for use in analyzing the environmental impacts associated with U.S. Department of Energy (DOE) low-level mixed waste (LLMW) management alternatives evaluated in the *Office of Waste Management Programmatic Environmental Impact Statement* (WM PEIS) (DOE 1996). This document addresses LLMW management alternatives for inventory and operations-generated wastes, i.e., wastes generated from waste management (WM) in the DOE system. Wastes derived from site restoration and from decontamination and decommissioning of DOE facilities (i.e., environmental restoration LLMW) are not addressed here. The WM LLMW includes the LLMW inventory currently (1994) in storage and the LLMW projected to be generated

through 2013 at 43 sites (see Notation, p. xi, for the shortened names or acronyms used for these sites).

Chapter 1 presents background information on regulatory requirements regarding the management of LLMW, the assumptions used to process existing data on LLMW streams, the methods used to assess the impacts of LLMW treatment/disposal, and the definition/delineation of LLMW. Specific information is presented in Chapter 2 about the sources of data on LLMW volumes, the aggregate waste volumes by site, the chemical and radiological profiles of the waste, and the assumptions that have been made to account for gaps in the database. Chapter 3 details the treatment and disposal routing of LLMW under specific waste management alternatives for WM LLMW and the waste volumes for each alternative. Chapter 4 describes representative technologies used to treat and dispose of LLMW, and Chapter 5 covers the LLMW treatment and disposal facilities that currently are operable or approved for construction/operation. Chapter 6 contains a brief description of the computational model used to estimate contaminant emissions and changes in volume and/or mass of LLMW during processing through proposed waste treatment facilities (Avci 1994). Chapter 7 discusses uncertainties in the data and in the modeling of proposed waste treatment scenarios. The input and output data for this analysis are presented in the Appendix.

1.1 DEFINITION OF WASTE TYPE

Low-level mixed waste is material that is both a hazardous waste under the Resource Conservation and Recovery Act (RCRA) and a low-level radioactive waste. Low-level waste (LLW) is radioactive waste that is not high-level waste (HLW), spent nuclear fuel, transuranic waste (TRUW), or by-product material as defined in Section 11e(2) of the Atomic Energy Act of 1954 (42 *United States Code* [USC] 2011 et. seq.). LLMW contains RCRA-regulated chemicals or special waste types in a form or concentration sufficient to render the waste hazardous under the guidelines of the *Code of Federal Regulations* (CFR), Title 40, Part 261 (40 CFR Part 261). Although waste contaminated with friable asbestos is not hazardous under federal RCRA rules, friable asbestos waste is considered a hazardous waste in several states. For the WM PEIS, low-level radioactive waste contaminated with friable asbestos is considered LLMW. High-level waste, spent nuclear fuel, and TRUW that may be contaminated with hazardous chemical constituents are not classified as LLMW and are not addressed in this document.

Low-level mixed waste is either contact-handled (CH) (dose at waste surface <200 mrem/h) or remote-handled (RH) (dose at waste surface >200 mrem/h). The handling category determines the level of protective shielding required to safely store and process the material. LLMW is also classified as either alpha LLMW (combined activity of TRUW radionuclides with half-lives greater than 20 years is from 10 to 100 nCi/g) or non-alpha LLMW (TRUW activity <10 nCi/g). The alpha status of LLMW is important in determining the choice of waste treatment facilities because, in some states, facilities that process alpha-containing wastes cannot be used for wastes with minimal TRUW activity. Mixed TRUW waste (TRUW activity >100 nCi/g) is not addressed in this document (see Hong et al.

1996). Together, the four radioactivity classifications — CH non-alpha LLMW, CH alpha LLMW, RH non-alpha LLMW, and RH alpha LLMW — determine the handling and routing for treatment and/or disposal of all LLMW.

The final criterion used to discriminate various LLMW types is the concentration of polychlorinated biphenyls (PCBs) in the waste. LLMW defined as PCB-contaminated contains at least 50 mg/kg (50 ppm), by weight, of PCBs and requires more rigorous incinerator treatment conditions than non-PCB-contaminated LLMW. In the WM PEIS analysis, LLMW contaminated with PCBs is treated as other LLMW, and the special handling, treatment, and disposal requirements are addressed on-site at the designated treatment and disposal location. Radioactively contaminated PCBs that are not considered RCRA hazardous are not included in this analysis.

1.2 WASTE STREAM CATEGORIES FOR LLMW

The most complete tabulation of information on LLMW is contained in the recent update of the 1994 *Mixed Waste Inventory Report* database (DOE 1994a); this database is referred to as MWIR-2 in this report and contains information on over 2,000 waste streams of LLMW from all DOE installations. The LLMW is grouped into nine major waste categories. In MWIR-2, these 2,000+ waste streams are further compiled into 109 waste stream treatment codes on the basis of physical-chemical characteristics. Many of these 109 waste streams have similar physical-chemical compositions that would allow the waste streams to be treated with the same technologies to reduce or stabilize the toxic materials within them. On the basis of similarities in the proposed treatment scheme, the 109 waste treatment codes have been condensed into 32 treatment codes for this analysis. Table 1.1* defines the 32 treatment codes and includes the corresponding waste categories from MWIR-2. For the WM PEIS, wastes in the first 23 treatment codes (constituting >99% of all untreated LLMW) are treated with a common set of proposed treatment technologies to allow a meaningful comparison between sites for the LLMW management alternatives.

1.3 TECHNOLOGY MODULES FOR LLMW TREATMENT

The Mixed Waste Treatment Project (a group organized by DOE to develop various treatment and disposal options for LLMW) has proposed a set of technologies to be used in the treatment of the LLMW listed in the MWIR-2 database. Waste treatment technologies can be described in terms of treatment modules for waste preparation, pretreatment, primary and secondary treatment, and preparation of treated waste for final disposal. A particular sequence of treatment modules constitutes a treatment train. A module can be part of one or more treatment trains. Each of the waste treatment codes shown in Table 1.1 has a unique treatment train.

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* For readability, all tables and figures are placed at the end of this chapter.

Wastes with different treatment codes may utilize the same treatment train but vary in the proportionate use of the individual treatment modules depending on the waste's physical-chemical characteristics. Wastes sufficiently different in their physical-chemical characteristics follow completely different treatment trains.

Figure 1.1 is the baseline treatment flowchart for LLMW for treatment codes 1 through 23. The flowchart shows all of the treatment technologies and how they interconnect in the overall LLMW treatment train. Treatment technologies are addressed in greater detail in Chapter 4. The remaining treatment codes (24 through 32) are not included in the WM PEIS baseline treatment flowchart and will only be followed by the volume of waste at each site. Wastes in treatment codes 24 through 30 require very specific treatment not considered in the proposed generic treatment flowchart. Wastes in treatment code 31 are inadequately characterized so that treatment cannot yet be determined. Wastes in treatment code 32 have already been treated and await disposal. Treatment code 14 is included with treatment code 13 in this analysis because of insufficient waste volume.

The Mixed Waste Treatment Project has developed a computer program that generates for each waste category in the MWIR-2 database the volume flow out of each treatment module shown in the treatment flowchart (Figure 1.1). For example, the waste volume flow out of the incinerator as gas to the secondary combustion chamber or as ash to the grout module varies dramatically depending on the physical-chemical characteristics of the input waste feed to the incinerator. The Mixed Waste Treatment Project supplied a unique set of volume flows for each of the treatment codes (1 through 23). This information is the basis for generating estimated contaminant air emissions and waste concentrations for each treatment center at each treatment site (see Section 2.5). The volume flows between treatment modules for wastes in codes 1 through 23 are discussed in the Appendix.

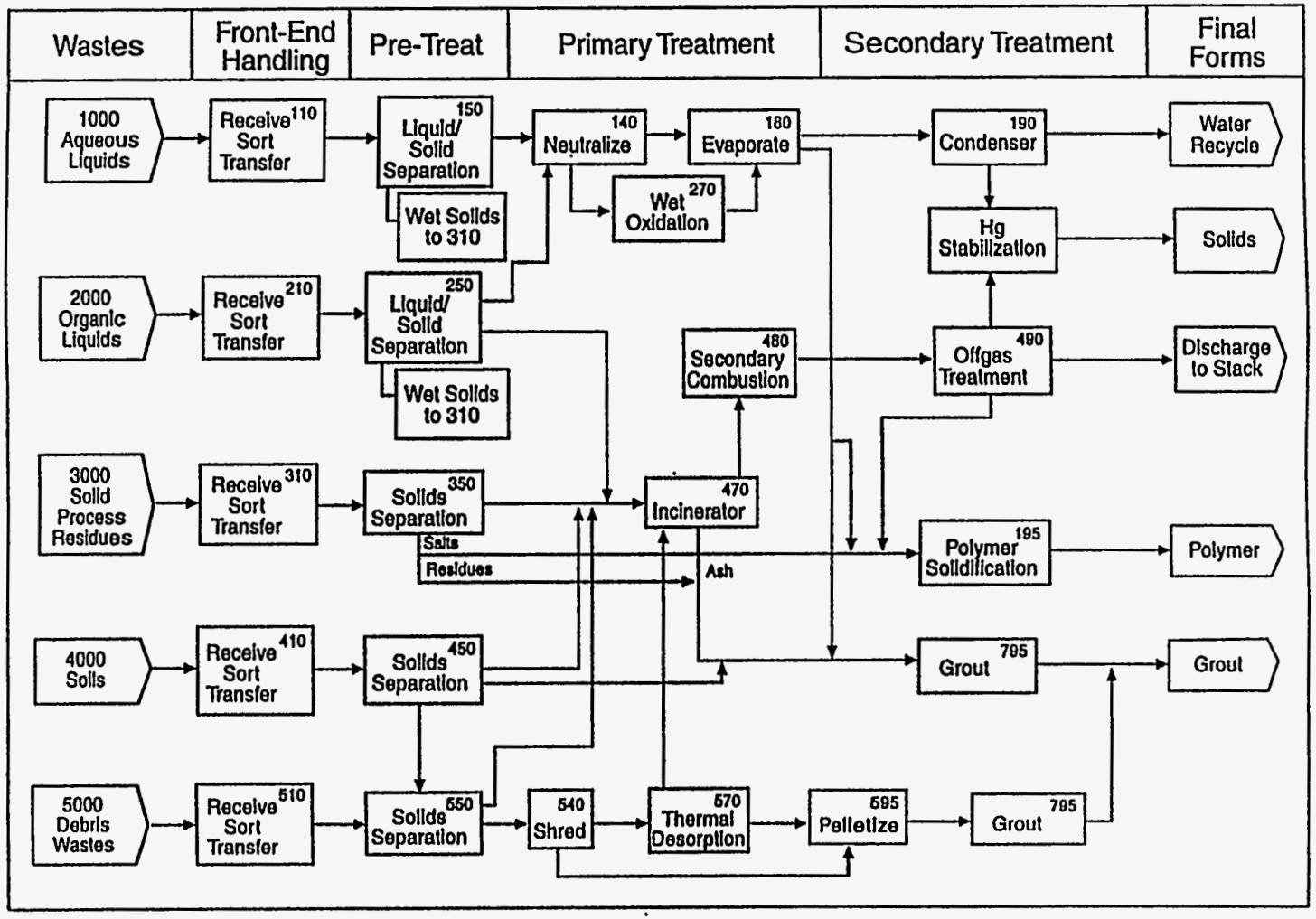

FIGURE 1.1 WM PEIS Consolidated Waste Management Flowchart for LLMW

TABLE 1.1 Waste Matrices for CH LLMW

Waste Stream				
MWIR-2 Category	WM PEIS Code	Name	Description
1000			
Aqueous liquids wastewater	11XX	1	Wastewaters	Aqueous liquids/slurries containing less than 1% total solids and 1% organic material.
			Acidic	pH<2.0
			Basic	pH>12.5
			Neutral	2.0<pH<12.5
			Cyanide	Basic wastewaters containing cyanides at or above applicable land disposal restrictions.
Aqueous waste	12XX	2	Aqueous slurries	Dissolved and particulate material ~15%.
			Acidic	pH<2.0
			Basic	pH>12.5
			Neutral	2.0<pH<12.5
			Cyanide	Basic aqueous slurries containing cyanides at or above applicable land disposal restrictions.
2000				
Organic liquids			Aqueous organic liquids	
	211X	3	Halogenated	Aqueous organics that contain up to 50% water and at least 1,000 ppm halogenated compounds.
	212X	4	Nonhalogenated	Aqueous organics that contain up to 50% water, less than 1,000 ppm halogenated compounds, and a wide variety of organic solvents (such as acetone and methanol).
			Organic liquids	
	221X	5	Halogenated	Organic liquids that contain less than 5% water and at least 1,000 ppm halogenated compounds.
	222X	6	Nonhalogenated	Organic liquids that contain less than 5% water, less than 1,000 ppm halogenated compounds, and large amounts of organic solvents (such as toluene and benzene).

TABLE 1.1 (Cont.)

Waste Stream				
MWIR-2 Category		WM PEIS Code	Name	Description
3000				
Solid process residues	311X +313X	7	Inorganic particulates	Wastes containing at least 50% by volume inorganic particulates, including residual or absorbed liquids, incinerator ash, dust, sand-blasting residue, vermiculite, aluminum oxides, paint wastes, iron fines, and ion-exchange media.
	312X	8	Inorganic sludges	Wastes containing at least 50% by volume inorganic sludges, including wastewater treatment sludges, pond sludges, off-gas treatment sludges, plating waste sludges, and reprocessing sludges.
	314X	9	Salt wastes	Wastes containing at least 50% by volume salts, e.g., evaporation bottoms, solids oxidizers, and reactive salts, including chloride salts, sulfate salts, and nitrate salts.
	315X	10	Solidified inorganic process residues	Wastes that have been immobilized with cement or other inorganic stabilization agents and cured into a solidified form but do not meet disposal criteria, e.g., cemented pond sludge and cemented fly ash.
			Organic particulates and sludges	
	321X	11	Nonhalogenated	Wastes containing at least 50% by volume organic particulates or sludges that contain less than 1,000 ppm halogenated compounds, e.g., activated-carbon floor sweepings and oily sludges.
	322X	12	Halogenated	Wastes containing at least 50% by volume organic particulates or sludges that contain at least 1,000 ppm halogenated compounds, e.g., freon sludge, grease cleaner sludges, and solids with absorbed solvents.
			Solid organic chemicals	
	323X-A	13	Nonhalogenated	Wastes containing at least 50% by volume solid, unused organic chemicals that contain less than 1,000 ppm halogenated compounds, such as plastic or epoxy wastes. These wastes are packaged in bulk form and are either being excessed or have been expired.

TABLE 1.1 (Cont.)

Waste Stream				
MWIR-2 Category		WM PEIS Code	Name	Description
3000 (cont.)				
Solid process residues (cont.)			Solid organic chemicals (cont.)	
	323X-B	14	Halogenated	Wastes containing at least 50% by volume solid, unused organic chemicals that contain at least 1,000 ppm halogenated compounds. These wastes are packaged in bulk form and are either being excessed or have been expired. Treatment code 14 has been combined with treatment code 13 for this analysis.
4000				
Soils			Contaminated soils	
	4100	15	Without debris	Waste that is greater than approximately 95% by volume soil and rock, including contamination from spills, etc.
	4200	16	With debris	Waste that is at least 50% by volume soil and at least 5% by volume other debris, not including rock.
5000				
Debris waste	5100	17	Metal debris	Debris that is approximately 95% or more, by volume, metal that includes metal debris without lead or cadmium, lead-containing metal debris, and cadmium-containing metal debris — e.g., scrap metals, cadmium-coated high efficiency particulate air (HEPA) filters, piping, and machine tools.
	5200	18	Inorganic nonmetal debris	Waste that is approximately 95% or more, by volume, or nonmetal debris that includes concrete debris, glass debris, ceramic/brick debris, rock debris, and asbestos debris.
	5300	19	Combustible debris	Debris that is approximately 95% or more, by volume, combustible materials that include materials constructed of plastic, rubber, wood, paper, cloth, graphite, and biological materials — e.g., rubber gloves, rags, plastic bags, and teflon.

TABLE 1.1 (Cont.)

Waste Stream				
MWIR-2 Category		WM PEIS Code	Name	Description
5000 (cont.)				
Debris waste (cont.)	5400	20	Heterogeneous debris	Waste that is at least 50% by volume debris materials that do not meet the criteria for assignment into categories 5100, 5200, or 5300 and associated subcategories. Examples of these wastes include composite filters, predominantly metal debris, mercury-contaminated debris, predominantly inorganic nonmetal debris, predominantly combustible debris, asphalt debris, and laboratory equipment.
6000				
Special waste	6110 +6140	21	Organic lab packs and scintillation cocktails	Lab packs that contain organic liquids or organic scintillation fluids packaged in vials.
	6120	22	Aqueous lab packs	Lab packs that contain aqueous liquids or aqueous scintillation fluids packaged in vials.
	6130	23	Solid lab packs	Lab packs of only solid chemicals or other solid materials.
	6210	24	Bulk reactive metals	Bulk reactive metals that meet the criteria for classification as water reactive per the third-third land disposal restriction rule (40 CFR 268.35). Typically this waste is sodium metal or sodium metal alloys.
	6300	25	Explosives/ propellants	Wastes that undergo rapid chemical transformations and produce large amounts of gases, heat, and explosion. Liquid nitroglycerine and trinitrotoluene are categorized as explosive regardless of their specific physical form.
	6400	26	Compressed gases/ aerosols	Wastes consisting of pressurized gas cylinders or aerosol cans that meet the criteria for classification as ignitable compressed gases per the third-third land disposal restriction rule (40 CFR 268.35).

TABLE 1.1 (Cont.)

Waste Stream				
MWIR-2 Category		WM PEIS Code	Name	Description
7000				
Inherently hazardous waste	7100	27	Elemental mercury	Bulk, pourable liquid mercury that may be packaged in small containers within a larger container holding other materials (e.g., lab pack configuration).
	7200	28	Elemental lead	Wastes containing at least 50% by volume bulk elemental lead such as lead bricks, sheets, and pipes.
	7300	29	Beryllium waste	Beryllium dust or beryllium chips and fines that may also contain beryllium dust.
	7410	30	Lead acid batteries	Wastes consisting of drained or undrained lead acid batteries.
8000				
Unknown	8000	31	Unknown matrix	This category includes waste for which insufficient characterization information exists to further categorize as a liquid or solid or as one of the specific waste forms.
9000				
Treated waste	9000	32	Final waste form	This category includes waste that has been immobilized to meet disposal criteria, including applicable land disposal restrictions. The five subcategories of final waste forms are cement forms, vitrified forms, metal forms, polymer forms, and other forms such as amalgamated mercury and microencapsulated lead.

2 INVENTORY AND GENERATION VOLUMES OF LLMW

2.1 LLMW INVENTORY ASSUMPTIONS

In 1993, DOE published the *Interim Mixed Waste Inventory Report* (DOE 1993). At that time, it was the most complete tabulation of data on mixed waste inventories under DOE management. In the fall of 1993, DOE issued a data call to all DOE sites for a more complete and updated assessment of mixed waste under their management. Preliminary results of this updated *Mixed Waste Inventory Report* were released in May 1994 (DOE 1994a). This new database on LLMW (called MWIR-2 in this report) contains data on accumulated waste inventories and projected 20-year generation rates for 2000+ waste streams. In many cases, the projected generation rate for a given waste stream is given only for 5 or 10 years. To develop a 20-year projection, the latest projection rate in the MWIR-2 database was extended through the remaining years for this analysis. All volume estimates derived from MWIR-2 have been quality checked by the sites. There are no data on the uncertainties in the volume numbers for each generating site.

Two specific waste streams have been excluded from the LLMW inventory. The aqueous single-shell tank waste at Hanford is, by definition, a LLMW. However, DOE transferred this waste stream (>100,000 m^3 (3,530,000 ft^3) to the HLW jurisdiction, and it is discussed by Folga et al. (1996). The B&C Pond sludge at Oak Ridge Reservation (ORR), ~16,000 m^3 (~920,000 ft^3), is currently being considered for commercial treatment and disposal and, thus, has not been included in this inventory.

DOE has reviewed more recent waste load data for LLMW to determine the need to revise the analyses for the Final WM PEIS (DOE, 1996). The *Mixed Waste Inventory Summary Report* for 1995 (DOE, 1995) was used for the review of the LLMW data. Selected reanalyses for specified sites were performed for LLMW when warranted, and the results of the reanalyses have been incorporated into the Final WM PEIS. Appendix I of the Final WM PEIS identifies the criteria for DOE's decision to reanalyze using the more recent data, compares the waste load data used in the Draft WM PEIS with the more recent data, and describes DOE's conclusions about the need to analyze the more recent data for specified sites. The criteria for selection of specified sites for reanalysis are based on the expected changes in the potential health risk effects to the workers and the public. Changes in risk are expected if there are large changes in the projected waste volumes at a particular site or the levels of sensitive radionuclides or chemicals are predicted to change significantly in the air emissions at a treatment site or the groundwater at a disposal site.

Reanalysis of LLMW using the more recent data was carried out for only two sites, ANL-E and NTS. These more recent data will, however, be used in the analysis only if these two sites are treating their own waste. ANL-E and NTS are treatment sites only in the Decentralized Alternative (case 2a) in the WM PEIS analysis. ANL-E and NTS, like all of the generating sites, treat their own aqueous wastes in each of the proposed LLMW management alternatives. Whenever ANL-E and NTS ship their wastes to another site for treatment, the earlier data used in the Draft WM PEIS analysis continues to be used in the

Final WM PEIS analysis. The data for ANL-E and NTS have been updated in this report to reflect the above considerations.

2.2 LLMW VOLUMES

Tables 2.1,* 2.2, and 2.3 show the total volumes by site and waste category (defined in Table 1.1) of WM LLMW currently (1994) in storage and the amount expected to be produced through 2013. If delays occur in the design and construction of LLMW treatment facilities, treatment of LLMW may not begin by 2003 as is currently planned. In this case, treatment of all WM LLMW would still be conducted over a 10-year (delayed) interval but adjustments would be needed to the LLMW inventories and their radiological profiles, as listed in this document.

2.3 HAZARDOUS CHEMICAL CONSTITUENTS

By definition, LLMW contains both radioactive constituents and RCRA-hazardous chemicals or meets the characteristics of RCRA wastes. This section profiles the composition of hazardous chemicals in LLMW. Information on the composition of over 2,000 individual WM LLMW streams has been updated in MWIR-2 (DOE 1994a); other LLMW data are summarized in the DOE *Waste Management Information System* (WMIS) (DOE 1992c). Of the 32 treatment codes defined for this analysis (as shown in Table 1.1), the WASTE_MGMT computational model developed by Argonne National Laboratory (Kotek et al. 1996) has been used to estimate chemical emissions only from waste codes 1 to 23, which contain the vast majority of LLMW (see Section 6.2). For the remaining waste codes (24 to 32), the volumetric impacts are addressed in the WM PEIS. Detailed chemical analyses of the RCRA-hazardous constituents in LLMW are available for only a limited number of LLMW streams; the majority of information on the hazardous chemical composition in LLMW is derived from knowledge of the industrial processes (site operational history) that generated the waste. Chemical profiles (i.e., the composition and concentration of RCRA-hazardous chemical constituents) for the 23 codes of CH non-alpha WM LLMW have been developed from (1) compilation of the chemical composition data presented in MWIR-2 and (2) an engineering assessment of the industrial processes that generated the respective LLMW streams. Chemical profiles for alpha LLMW have not been developed separately because of the relatively small volume (compared with non-alpha LLMW).

Information about historical DOE site operations and industrial processes, as well as MWIR-2 information, suggests that waste streams of a given treatment code from different sites in the DOE complex are similar in chemical composition. The data indicate that chemical composition is more strongly dependent on the processes that generated the waste than on the site where the waste originated. Therefore, the chemical profiles for the LLMW are assumed to be independent of the site that generated the waste and are dependent only

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* For readability, all tables are placed at the end of this chapter.

on the waste stream treatment code. Although there are over 100 individual chemical species identified in the MWIR-2 database, many of these chemicals either are present in minute quantities, are limited to only a few waste streams, or are not regulated as RCRA-hazardous chemicals. To provide a consistent assessment of chemicals that is comparable across waste treatment codes, the chemical profiles developed for this report focus on 16 distinct chemicals and/or grouped classes of chemicals that are common to most waste streams. These include six toxic metals, three inorganic chemicals, and seven classes of organic chemicals that are grouped according to important treatment parameters such as density, solubility, volatility, and degree of chlorination. Table 2.4 presents chemical profiles for the WM LLMW; the LLMW categories and codes correspond with those described in Table 1.1. Uncertainties introduced by assumptions made for developing chemical profiles are discussed in Chapter 7.

2.4 RADIOLOGICAL PROFILES FOR LLMW

Determination of radionuclide concentrations for LLMW is difficult because there is insufficient information in either MWIR-2 (DOE 1994a) or the current WMIS database (DOE 1992c) to quantify radionuclide composition or activities. Given the current data, it is not possible to construct precise LLMW radiological profiles that adequately reflect specific characteristics for both site and waste stream. The site operational mission is primarily responsible for the radionuclides generated at each site. Given that the radionuclides tend to contaminate all radioactive waste streams considered in the WM PEIS, it is assumed that radiological profiles for LLMW are site dependent but waste stream independent. The LLMW radiological profiles developed in the WM PEIS are based on information about the specific mission and operational history that generated radionuclides at the various sites and on the LLW information in the *Integrated Data Base for 1992* (IDB) (DOE 1992b).

The IDB has information, accumulated over many years, about the concentrations and activities (Ci) of various radionuclides in LLW. The particular radiological profile of a given LLW stream is dependent upon the operation(s) that generated the radionuclides. The profiles are grouped into five distinct source term categories: (1) fission products, (2) induced activity, (3) uranium/thorium (U/Th), (4) TRUW, and (5) tritium. The IDB data provide radiological profiles for the five different LLW source term categories close to the time of waste generation. The IDB data also provide the amount (volume and activity) of each of the five LLW source term categories accumulated at each of the major DOE sites. Because the data have been collected over a number of years, they represent the cumulative result of the various DOE waste-generating activities over those years.

In estimating the radiological profiles for the LLMW in the WM PEIS, it has been assumed that at the time of waste generation, LLMW radiological profiles for each site are the same as those for LLW because the same site operational mission(s) is responsible for generating both LLW and LLMW. However, because the time interval between generation and treatment is much greater for LLMW than for LLW, it is more important to account for radioactive decay for LLMW than for LLW. LLW is normally disposed of soon after generation; thus, its radiological profile will not be much different at the time of disposal than at the time of generation. On the other hand, because the proposed treatment of LLMW

is to begin in 2003, the age of the LLMW at the time of treatment will be much greater than that of LLW. Therefore, the radioactive profile of LLMW at the time of treatment will differ considerably from its profile at the time of generation.

To estimate the time interval between LLMW generation and treatment, the treatment date for all LLMW is assumed to be 2008, the midpoint of the proposed treatment period of 2003 through 2013. (If a different 10-year treatment period were selected, adjustments would be needed to the LLMW inventories and their radiological profiles as listed in this document.) The average generation date estimates are different for different sites and for the two different waste groups, that is, current inventory and waste projected to be generated over an ensuing 20-year period. The generation dates were determined by estimating the average date (given site history) of radionuclide generation, except for the U/Th source term. For the U/Th source term, the generation time is defined as the time of the most recent chemical or isotopic concentration/isolation of the material.

Thus, the principal assumptions on which LLMW radiological profiles were estimated are as follows:

- At the time of waste generation, LLMW radiological profiles for each site are the same as those for LLW (derived from the IDB) at the same site.
- At the time of waste generation at a given site, the relative intensities (activities per unit volume, in Ci/m^3) for both alpha and non-alpha LLMW are the same as those for LLW.
- At the time of treatment, the radiological characteristics of LLMW will be different from those of the corresponding LLW only because of the greater age of the waste.
- The treatment date for all LLMW is 2008.
- The average generation date of LLMW depends on the site and on whether it comes from inventory or projected generation.
- The IDB information on LLW does not distinguish between alpha-contaminated waste (TRUW content = 10 to 100 nCi/g) and non-alpha-contaminated waste (TRUW <10 nCi/g). This analysis assumes a geometric mean of 33 nCi/g of TRUW activity for alpha-contaminated LLMW. The equivalent TRUW activity for non-alpha-contaminated LLMW is estimated to be 1.7 nCi/g based on a comparison of certain alpha and non-alpha LLMW. For example, for waste with a density of 2,500 kg/m^3 (156 lb/ft^3), the TRUW activity is equivalent to 0.082 Ci/m^3 (0.0023 Ci/ft^3) and 0.004 Ci/m^3 (0.0001 Ci/ft^3) for alpha and non-alpha waste, respectively.

- For sites that have a gaseous diffusion plant (GDP) or that store GDP waste, adjustments were made to the U/Th source term by the addition of technetium-99 (Tc-99) — which, through carryover of gaseous Tc-99 fluoride in the GDP process, is present (in small amounts) in this specific waste type.

The proportional LLMW source term distribution by site and the site-dependent activity percentages for the CH LLMW (non-alpha) and CH LLMW (TRUW alpha) are given in Table 2.5. The data in this table were derived from IDB data on the accumulated radioactivity (in Ci) for LLW at each site. For major sites, the appropriate times of radionuclide generation/isolation are given in Table 2.6. The relative radiological profiles for the different source terms derived from LLW data are listed in the Appendix. The coupling of the appropriate waste ages, activity percentages, and source term radiological profiles will generate site-dependent radiological profiles and activity concentrations for LLMW. The individual site radiological profiles are listed in the Appendix.

The DOE sites included in Table 2.5 contain more than 98% of the total LLMW. The radiological profiles for additional small DOE sites are approximated as being similar to one of the large DOE sites included in Table 2.5 on the basis of similarities in program missions between the large and small sites. Table 2.7 shows the assumed similarities between the radiological profiles of the small and large DOE sites used in this analysis.

TABLE 2.1 CH Alpha LLMW Volumes from MWIR-2, Non-PCB

Site[a]	Volume (m^3) per MWIR-2 Category[b] 1000	2000	3000	4000	5000	6000	7000	Total[c] (m^3)	Source[d]
Bettis	-		-	-	10.7	-	-	10.7	I
	-	-	-	-	0.2	-	-	0.2	P
INEL	5.9	-	3500	214	17,400	-	3,510[e]	24,600	I
	0	-	0	0	0	-	0	0	P
ITRI	-	-	-	-	-	1	-	1	I
	-	-	-	-	-	0.4	-	0.4	P
LANL	2.5	117	0.4	-	185	19.4	10.4	335	I
	15.5	563	2.7	-	1,090	82	44.5	1,790	P
LBL	-	-	-	-	-	-	0.4	0.4	I
	-	-	-	-	-	-	4	4	P
LLNL	-	32.8	34	0.2	31.4	3	-	101	I
	-	607	629	3.7	581	55.5	-	1,880	P
Mound	-	25.9	-	-	<0.1	43.3	5.8	75.2	I
	-	4.2	-	-	<0.1	0	<0.1	4.2	P
RFETS	45,500	142	9,840	43.6	492	5.6	33.3	56,000	I
	2,210	112	8,460	1,150	1,420	180	38.6	13,500	P
SRS	-	106	0	18.1	2,800	-	-	2,920	I
	-	0	527	0	644	-	-	1,170	P
UofMO	-	-	-	-	0.4	-	-	0.4	I
	-	-	-	-	1	-	-	1	P
WVDP	0.7	5.5	9.2	-	<0.1	0.7	1.4	17.7	I
	10.5	13.8	6.5	-	<0.1	0.2	1.1	32.5	P
Total	45,500	324	13,400	276	20,900	73	3,560	84,033	I
	2,240	1,190	9,620	1,150	3,730	318	88.2	18,336	P

[a] See Notation (p. xi) for site definitions.

[b] A hyphen indicates no inventory and no projected generation reported for the specific waste stream. A zero indicates either no projection or inventory volume.

[c] Total contains roundoff from individual sums.

[d] I = LLMW in current (1994) inventory; P = 20-year projected generation.

[e] Category listed as unknown (8000) waste stream for INEL.

TABLE 2.2 CH Non-Alpha LLMW Volumes from MWIR-2, Non-PCB

Site[a]	Volume (m^3) per MWIR-2 Category[b,c] 1000	2000	3000	4000	5000	6000	7000[d]	Total[e] (m^3)	Source[f]
Ames	0	-	-	-	-	0.2	0.1	0.3	I
	0.1	-	-	-	-	0	0	0.1	P
ANL-E	5.4	0	5.1	0	0.9	4.5	17.5	33	I
	14.7	0	15.0	10.0	9.0	1.8	71.8	126	P
ANL-W	0.4	-	3.8	-	5.5	2	-	11.8	I
	0.3	-	0	-	4.8	3.4	-	8.5	P
BCL	-	-	-	-	-	-	0		I
	-	-	-	-	-	-	0.1	0.1	P
Bettis	0	0.5	6.5	2.3	2.7	-	3.4	15.6	I
	0	0.2	0.8	0	0	-	11.9	12.9	P
BNL	-	17.5	59.8	-	-	5.9	1.5	84.8	I
	-	3.1	101	-	-	2.2	3.3	109	P
Charleston	-	-	0	-	0.1	-	0.2	0.3	I
	-	-	0.2	-	0.9	-	2.2	3.3	P
Colonie	0.8	10	-	-	-	-	-	10.8	I
	0	0	-	-	-	-	-	0	P
ETEC	-	0.1	4.5	600	7.4	-	38	650	I
	-	0	0	600	0	-	0	600	P
FEMP	748	196	1,490	7.2	137	1	6.5	2,590	I
	5.9	32.9	0.8	0	8.3	0	0.3	48.5	P
GA	25.1	0.6	4.8	-	10.8	0.2	1.2	42.9	I
	0	0.2	0	-	0	0.2	0	0.4	P
GJPO	0.5	0.1	-	0	-	0	-	0.7	I
	0.2	0	-	0.5	-	0.2	-	1.0	P
Hanford	0	-	2,460	32.8	299	134	139	3,070	I
	-	-	5,460	8,440	8,900	8,290	491	31,600	P
INEL	113	29.6	23.4	4.4	123	4.9	416	715	I
	20.9	7.6	333	25	554	2.1	156	1,090	P
ITRI	-	0	-	-	-	2.6	0	2.6	I
	-	1	-	-	-	29.9	1.2	32.2	P
KAPL-S	-	0.1	0.2	0	0.6	0	0.3	1.2	I
	-	8.4	3.3	67.2	13.8	10.8	3.8	107	P
KAPL-W	-	0	0	0	0	0	0	0	I
	-	0.9	4.5	12.6	16.8	0.8	10	45.6	P
KCP	-	-	-	-	0.8	-	-	0.8	I
	-	-	-	-	0	-	-	0	P

TABLE 2.2 (Cont.)

Site	Volume (m^3) per MWIR-2 Category[b,c] 1000	2000	3000	4000	5000	6000	7000[d]	Total[e] (m^3)	Source[f]
LANL	6.3	10.8	11.3	-	30.4	0.6	271	330	I
	35.6	62.6	23.5	-	193.5	2.7	0	324	P
LBL	-	3.8	-	-	0.8	16.6	0.3	21.5	I
	-	0	-	-	80	180	0.8	261	P
LEHR	0.5	-	0	-	3	-	2	5.6	I
	0	-	2.8	-	0	-	0	2.8	P
LLNL	-	60	41.3	4	3	0.8	4.5	114	I
	-	1,110	764	74	55.5	14.8	60.8	2,080	P
Mare Is	-	-	0.8	-	8.8	-	-	9.7	I
	-	-	10.4	-	31.8	-	-	42.2	P
Middlesex[g]	-	-	-	24,500	-	-	-	24,500	I
	-	-	-	0	-	-	-	0	P
Mound	-	-	-	-	-	-	<1	<1.0	I
	-	-	-	-	-	-	<1	<1.0	P
Norfolk	-	-	0	-	0	-	-	0	I
	-	-	4	-	2	-	-	6	P
NTS	-	0.2	26.1	30.8	-	-	4.9	297	I
	652	-	-	2,061	-	-	-	2,713	P
ORR									
ORNL	53.2	80.4	74.7	4.1	1.6	35.9	2.8	253	I
	333	126	137	0	0.7	24.4	1	622	P
K-25	274	380	10,000	3.7	180	5.4	243	11,100	I
	571	8,830	3,380	2.2	3,150	39.6	46.7	16,000	P
Y-12	4.5	340	4,980	6410	142	44.8	6.3	11,900	I
	27	2,420	3,150	110	1,580	3.2	30.4	7,320	P
Pantex	6.8	3.7	22	0.1	89.8	11.1	0.3	134	I
	27.9	12.4	5.4	0	478	18.5	13.4	556	P
Pearl H	-	<0.1	1.8	-	0	-	<0.1	1.9	I
	-	<0.1	2	-	1.5	-	<0.1	3.5	P
PGDP	23.7	337	25.8	-	116	18.6	75.4	596	I
	0	0	0	-	0	0	0	0	P
Pinellas	<0.1	-	-	-	-	-	-	<0.1	I
	<0.1	-	-	-	-	-	-	<0.1	P
PORTS	122	107	679	18.7	3,470	18.2	59.3	4,470	I
	878	396	1,840	5	19,700	76.4	234	23,100	P
Ports Nav	-	-	0.2	-	-	-	0.2	0.4	I
	-	-	0.8	-	-	-	0	0.8	P

TABLE 2.2 (Cont.)

Site[a]	Volume (m^3) per MWIR-2 Category[b,c] 1000	2000	3000	4000	5000	6000	7000[d]	Total[e] (m^3)	Source[f]
PPPL	-	-	-	-	-	<0.1	-	<0.1	I
	-	-	-	-	-	<0.1	-	<0.1	P
Puget So	-	0.4	37.9	-	18	-	-	56.4	I
	-	0	0	-	110	-	-	110	P
RMI	1.5	6.8	4.1	-	9.7	-	-	22.1	I
	4.4	0.6	1	-	1	-	-	7	P
SNL-CA	-	8.9	0.9	-	-	1.4	-	11.3	I
	-	81.2	9.7	-	-	11.7	-	103	P
SNL-NM	-	<0.1	<0.1	-	62	0.2	3.3	65.6	I
	-	<0.1	<0.1	-	0	0	0	0	P
SRS	50[h]	25.1	1,820	-	1,330	1	276	3,480	I
	0[h]	5,320	515	-	26.5	0	60	5,900	P
WSSR[g]	11.1	25.1	59.5	0.2	1,520	5.2	18.6	1,640	I
	0	0	0	0	0	0	0		P
Total	1,430	1,644	21,846	32,102	7,601	356	1,507	66,000	I
	1,907	18,414	17,646	15,436	35,106	8,740	1,204	98,500	P

[a] See Notation (p. xi) for site definitions.

[b] Does not include 9000 (treated) wastes; INEL = 8.4 m^3, K-25 (ORR) = 15,800 m^3, LANL = 270 m^3, PGDP = 59 m^3, and SRS = 500 m^3.

[c] A hyphen indicates no inventory and no projected generation reported for the specific waste stream. A zero indicates either no projection or inventory volume.

[d] Includes minor amounts of unknown (8000) wastes.

[e] Total contains roundoff from individual sums.

[f] I = LLMW in current (1994) inventory; P= projected 20-year LLMW generation.

[g] Wastes would be managed on-site and are not included in the scope of the WM PEIS. The volumes shown here are for reference only and are not evaluated in this report.

[h] Further clarification of MWIR-2 data revised the SRS 1000-series waste category definitions to I = 86 m^3 and P = 4,900 m^3. These revised data are not evaluated in this report.

TABLE 2.3 RH Non-Alpha LLMW Volumes from MWIR-2

Site[a]	Volume (m^3) per MWIR-2 Category[b] 1000	2000	3000	4000	5000	6000	7000	Total[c] (m^3)	Source[d]
ANL-W	-	-	0	-	0	4.1	-	4.1	I
	-	-	2	-	0.4	4.8	-	7.2	P
Bettis	-	-	<0.1	-	-	-	-	<0.1	I
	-	-	<0.1	-	-	-	-	<0.1	P
Hanford	-	-	0.2	-	-	-	0.5	0.7	I
	-	-	0	-	-	-	0	0	P
INEL									
Non-alpha	-	-	-	-	71.3	0.6	54.4	126	I
	-	-	-	-	8,000	0	504	8,500	P
Alpha	-	-	0.4	-	6.3	-	-	6.7	I
	-	-	0	-	0	-	-	0	P
ORR	2,320	-	-	-	-	-	-	2,320	I
	1,160	-	-	-	-	-	-	1,160	P
SRS	77.4	-	10.2	-	0.2	-	-	87.8	I
	1,500	-	0	-	19.4	-	-	1,520	P
Total	2,400	-	10.8	-	77.8	4.7	54.9	2,550	I
	2,660	-	<0.1	-	8,020	4.8	504	11,200	P

[a] See Notation (p. xi) for site definitions.

[b] A hyphen indicates no inventory and no projected generation reported for the specific waste stream. A zero indicates no projection or inventory volume.

[c] Total contains roundoff from individual sums.

[d] I = LLMW in current (1994) inventory; P = 20-year projected generation.

TABLE 2.4 Chemical Profiles for WM LLMW

Contaminant	Concentration (mg/kg) per Waste Stream[a,b]										
	11XX (1)	12XX (2)	211X (3)	212X (4)	221X (5)	222X (6)	311X +313X (7)	312X (8)	314X (9)	3150 (10)	321X (11)
Arsenic	2.4	1.4	11	-	-	7.7	8.3	25	3	-	-
Barium	220	1.0	75	-	-	33	260	2,000	1,650	-	-
Cadmium	8.9	17	-	4.9	1,100	1,100	120	40	-	22	60
Chromium	390	34	-	210	960	920	450	2,300	860	3,000	20
Lead	110	65	27	50	210	210	200	2,700	76	2	36
Mercury	0.2	0.23	220	280	6.3	6.0	135	790	-	7	39
Selenium	6	.5	37	40	-	-	36	340	-	-	1
Silver	10	1.6	44	44	-	-	10	70	8	-	11
Cyanides	50	45	-	180	-	-	-	150	-	-	
Acetone, butanone, methanol[c]	55,000	50	390	360,000	6,400	140,000	20,000	5,000	-	11	10,000
Toluene, xylene, benzene[c]	0.6	11	1,500	11,000	330	440,000	40,000	10,000	-	37	5,000
Trichloroethanes, etc.[c]	21	63	13,800	800	121,000	7,500	12,000	2,200	120	97	160
Tetrachloroethane, etc.[c]	60	59	780	45	27,000	1,600	2,200	20	-	150	1,200
Dichloroethanes, etc.[c]	10	50	370	-	850	500	200	80	-	4	40
Methylene chloride	10	10	130	-	1,600	960	200	80	-	4	40
Chlorofluoro-hydrocarbons[c]	5	5	300	-	50	-	90	90	-	63	20

TABLE 2.4 (Cont.)

Contaminant	Concentration (mg/kg) per Waste Stream[a,b]										
	322X (12)	3230 (13,14)	4100 (15)	4200 (16)	5100 (17)	5200 (18)	5300 (19)	5400 (20)	6110 (21)[d]	6120 (22)	6130 (23)
Arsenic	-	-	5	5	1.7	-	-	10	-	-	-
Barium	-	-	15	15	-	1,000	400	2,000	-	-	-
Cadmium	60	2.7	3	3	300	1	2	5	-	1.6	5
Chromium	20		20	20	1,500	4	15	2,000	-	20	5
Lead	36	7.7	40	40	10,000	10	100	5,000	-	12	5
Mercury	39	-	5	5	250	200	2	100	-	-	5
Selenium	1	-	1.5	-	20	-	3	30	-	-	-
Silver	11	-	10	10	-	-	10	30	-	100	5
Cyanides								170	-	-	-
Acetone, butanone, methanol[c]	2,500	230	10	10	5	-	5	50	120,000	-	5
Toluene, xylene, benzene[c]	5,000	430	10	10	100	-	10,000	1,000	250,000	-	-
Trichloroethanes, etc.[c]	2,500	32	10	10	2,000	4	2,500	560	100,000	-	10
Tetrachloroethane, etc.[c]	19,000	15	7	7	1,200	-	1,200	350	80,000	-	-
Dichloroethanes, etc.[c]	600	51	-	-	400	-	700	200	10,000	-	-
Methylene chloride	600	-	-	-	1,200	-	600	200	20,000	10	
Chlorofluoro-hydrocarbons[c]	300	-	-	-	500	-	1,000	100	-	-	-

[a] Waste streams are identified by MWIR-2 category (top line) and by WM PEIS code (second line, in parentheses).

[b] A hyphen indicates no measured concentration.

[c] Total concentration for all organic compounds within group.

[d] Concentration within the organic liquid portion of the combined waste stream.

TABLE 2.5 Percentage and Intensity by Activity near the Time of Generation of CH LLMW

Waste Type	Site	Percentage[a] Fission Products	U/Th	H-3[b]	TRUW	Induced Activity	Intensity (Ci/m^3)
Non-alpha	FEMP	-	100	-	-	-	0.008
	Hanford	90	0.01	5	0.025	5	16.5
	INEL	6	0.1	6	0.005	88	80
	LANL	2	0.01	95	0.08	3	5.1
	LLNL	0.1	0.01	99	0.005	-	105
	ORR	30	1	1	0.3	68	2.9
	PGDP	-	100	-	-	-	2.7
	PORTS	-	100	-	-	-	0.002
	RFETS	-	0.1	-	99.9	-	0.005
	SRS	7	0.01	46	0.025	47	16.5
Alpha	Hanford	90	0.01	5	0.5	5	16.6
	INEL	6	0.1	6	0.1	88	80.1
	LANL	2	0.01	93	1.6	3	5.2
	LLNL	0.1	0.01	99	0.1	-	105
	ORR	28	1	1	6	64	3.0
	RFETS	-	0.1	-	99.9	-	0.1
	SRS	7	0.01	46	0.5	47	16.6

[a] A hyphen indicates no significant concentration.

[b] H-3 = tritium.

TABLE 2.6 Time of Radionuclide Generation[a]

Site	Current Inventory	20-Year Projected Generation
FEMP	1965	1965
Hanford	1965	1965
INEL	1965	2000
LANL	1985	2000
LLNL	1985	2000
NTS	NA[b]	NA
ORR	1965	1985
PGDP	1965	1985
PORTS	1965	1985
RFETS	1965	1985
SRS	1965	1985

[a] 1965 = 43 years to treatment, 1985 = 23 years to treatment, and 2000 = 8 years to treatment (treatment assumed as 2008).

[b] NA = not applicable because no WM waste is listed in MWIR-2.

TABLE 2.7 Similarities of Radiological Profiles between Small and Large DOE Sites[a]

Small Site	Large Site
ANL-E (Illinois)	ORR[b] (Tennessee)
Ames (Iowa)	FEMP (Ohio)
BNL (New York)	ORR[b] (Tennessee)
Bettis (Pennsylvania)	Hanford (Washington)
Colonie (New York)	FEMP (Ohio)
Charleston (South Carolina)	INEL (Idaho)
ETEC (California)	ORR (Tennessee)
GJPO (Colorado)	FEMP (Ohio)
ITRI (New Mexico)	LANL[b] (California)
LBL (California)	LLNL (California)
LEHR (California)	ORR[b] (Tennessee)
KAPL-W (Connecticut)	INEL (Idaho)
KAPL-K, KAPL-S (New York)	INEL (Idaho)
KCP (Missouri)	INEL (Idaho)
Mare Island (California)	INEL (Idaho)
Middlesex (New Jersey)	FEMP (Ohio)
Mound (Ohio)	LLNL (California)
Norfolk (Virginia)	INEL (Idaho)
NTS (Nevada)	ORR (Tennessee)
Pantex (Texas)	LANL[b] (California)
Pearl Harbor (Hawaii)	INEL (Idaho)
Pinellas (Florida)	LLNL (California)
Portsmouth (Maine)	INEL (Idaho)
PPPL (New Jersey)	LLNL (California)
Puget Sound (Washington)	INEL (Idaho)
RMI (Ohio)	FEMP (Ohio)
SNL-NM (New Mexico)	SRS (South Carolina)
WSSR (Missouri)	FEMP (Ohio)
WVDP (New York)	Hanford (Washington)

[a] The radiological profiles of the small sites were assumed to be similar to those given in the IDB for the respective large sites.

[b] Alpha waste only.

3 WASTE VOLUMES OF THE LLMW ALTERNATIVES

This chapter discusses the LLMW management alternatives and identifies the volumes of wastes that would be managed at each site under each alternative. Currently, 43 sites report LLMW. Waste volumes have been estimated for five major alternative strategies that encompass eight LLMW cases. The alternatives differ in the location of treatment and disposal sites and in the assignment of treatment and disposal site to the waste-generating sites. All alternatives (except no action) would employ the same treatment technologies as outlined in Figure 1.1.

The five major alternatives are (1) No Action, (2) Decentralized, (3) Regionalized, (4) Centralized, and (5) RH-Waste Treatment. The major alternatives for LLMW have been subdivided into eight cases, as follows: (1) the No Action Alternative is Case 1 (current treatment capabilities only — no disposal); (2) the Decentralized Alternative is Case 2a (43 treatment and 16 disposal sites); (3) the Regionalized Alternative includes Case 4 (11 treatment plus one special treatment site exception and 12 disposal sites), Case 7 (7 treatment and 6 disposal sites), Case 10a (7 treatment and 1 disposal site), and Case 15 (4 treatment and 6 disposal sites); (4) the Centralized Alternative includes only Case 17 (1 treatment and disposal site); and (5) the RH-Waste Alternative is Case 26 (4 treatment and disposal sites). Section 3.1 addresses the assumptions used for these alternatives. The alternatives and the cases analyzed are discussed in Section 3.2, and Section 3.3 presents the waste inputs for each case and discusses the unique assumptions and the methodology used to estimate these waste loads.

Radiological and chemical air emissions and contaminant concentrations have been computed separately for each technology module under each alternative. The cumulative impacts of waste management alternatives for WM waste are discussed in the text of the WM PEIS (DOE 1996).

3.1 ASSUMPTIONS

In constructing the waste volumes for each LLMW management alternative/case, assumptions have been made regarding the waste input volumes, treatment activities, and shipping disposal limitations.

3.1.1 General Assumptions

The WM PEIS analysis considers a generic 10-year treatment period. The actual time of treatment must be established because significant corrections for radioactive decay in the LLMW must be carried out. Therefore, it is assumed that the current WM LLMW inventory plus annual operations-generated LLMW from 1993 to 2013 would be treated during the 10-year period of 2003 to 2013. Following 2013, it is assumed that treatment would be conducted only for annual maintenance requirements. New facilities would be

placed in operation in the year 2003. Design and construction for new facilities would begin in 1995. Any slippage in the design and construction of the new facilities would still entail, in these alternatives, treatment of all WM LLMW over a 10-year period.

In the waste input calculations, several sites are included as combined totals. These are ANL-W with INEL, SNL-CA with LLNL; and K-25, Y-12, and ORNL as ORR.

3.1.2 Treatment/Disposal Assumptions

The LLMW alternatives discussed in Section 3.3 assume treatment using only the base option. This option requires thermal treatment of organics and stabilization using cement and/or polymer processes. Aqueous liquid LLMW (treatment codes 1 and 2) would be treated on-site under all alternatives, and the residue would then be stabilized. The aqueous liquid residue would be segregated from other LLMW when shipped for final treatment. Disposal of these residues would be at the disposal sites, as discussed in Section 3.3.2. All LLMW would be treated to meet RCRA land disposal restrictions. RH waste would be treated and disposed of on-site at the four major sites that contain such waste: Hanford, INEL, ORR, and SRS. Only Bettis, with minor quantities of RH, would ship RH waste to ORR for treatment and disposal.

CH alpha and CH non-alpha wastes would be treated in separate facilities. The concentration of PCBs in the majority of LLMW streams is assumed to not exceed 50 mg/kg (50 ppm). Identified waste streams contaminated with PCBs >50 mg/kg (>50 ppm) would be treated separately from non-PCB waste and would be processed separately for alpha and non-alpha radioactive waste. For all alternatives except the Centralized Alternative, treatment of alpha LLMW is assumed at five sites: Hanford, INEL, LANL, RFETS, and SRS.

For the No Action Alternative (Case 1), it is assumed that only sites with an existing complete treatment train for a specific LLMW treatment code have the current capability to treat that waste. For sites that do not have the current treatment capacity, the LLMW would be stored indefinitely on-site.

Disposal is assumed to entail belowgrade disposal without vaults in the West and aboveground vaults in the East, except for SRS. SRS would dispose of LLMW in belowgrade vaults.

3.1.3 Alternative-Specific Assumptions

The transportation of LLMW for treatment and/or disposal for Cases 4 through 17 is organized according to the proximity of a waste generation site to those large sites designated as having facilities to treat and/or dispose of a given LLMW. The transportation routing organization is intended to minimize the environmental and health impacts from waste transportation. Alpha waste would only be treated and disposed of at Hanford, INEL, LANL, RFETS, and SRS, with disposal only at NTS.

3.1.4 Waste Loads and Waste Stream Assumptions

The LLMW loads have been derived from data provided in MWIR-2. Table 3.1* shows the correlation of LLMW classification categories. Descriptions of specific LLMW waste categories and the treatment codes are provided in Sections 1.2 and 1.3. All LLMW is designated for treatment/disposal on the basis of six major radiological/chemical identifiers: CH non-alpha, CH alpha, RH non-alpha, RH alpha, PCB-contaminated CH non-alpha, and PCB-contaminated CH alpha.

Treatment and disposal of the LLMW is assumed to occur over the 10-year period of 2003 to 2013. Processing would cover inventory LLMW in current (1994) storage, operations-generated waste from 1994 to 2003, and site operations-generated waste during the 2003 to 2013 processing time frame. The annual waste throughput volumes used for analyses in the WM PEIS were calculated by dividing by 10 years the sum of the inventory and 20-year projected operations waste volumes for each waste stream presented in MWIR-2 (see Tables 2.1 through 2.3).

3.2 ALTERNATIVES AND CASE DESCRIPTIONS

The primary factors used to determine the treatment and disposal alternatives for LLMW were the types and quantities of waste at a given site, and the location of waste generating, treatment, and disposal sites relative to each other and within geographical regions of the United States. The status of existing treatment and/or disposal facilities at a site was a secondary consideration. The Decentralized, Regionalized, and Centralized Alternatives include several different waste management site configurations that were designed to maximize the treatment and disposal benefits, while minimizing potential impacts to the environment and to health and safety. The disposal location for aqueous treatment residues may differ from other site waste. The site shipping configurations for all alternatives (excluding No Action) are shown in Table 3.2.

The RH-Treatment Alternative (Case 26) applies for all RH LLMW and requires treatment and disposal of RH LLMW at the four major sites generating this waste. No shipment of RH LLMW would occur, except for the minor amount of RH LLMW shipped from Bettis to ORR.

3.3 LLMW VOLUMES BY ALTERNATIVE/CASE

The five major LLMW management alternatives are discussed in Sections 3.3.1 through 3.3.4. Tables are presented that show the annual volume shipments from generation sites to treatment sites and from treatment sites to disposal sites for the seven cases included in the five alternatives. Waste shipment volumes to treatment sites are shown by MWIR-2 waste category and by WM PEIS treatment code. Because treatment of waste categories

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* For readability, all tables are placed at the end of this chapter.

7000 to 9000 is not addressed in the WM PEIS, the volumes from treatment codes 24 to 33 are presented as aggregate totals. The volumes of PCB-contaminated LLMW are given in Section 3.3.7.

3.3.1 No Action Alternative: Case 1

The No Action Alternative (Case 1) would require the least modification of existing DOE management for LLMW. Under this alternative, all LLMW would either be processed on-site or remain in indefinite storage if there was no capability to process the waste. There would be no shipment of wastes for treatment or disposal. Waste would be treated at those sites that have a complete treatment train to process a given waste stream into a disposal-ready form. In addition, only existing facilities and facilities that have current (1994) National Environmental Policy Act (NEPA) approval for construction and/or operation were assumed to be available to process LLMW. No construction of new treatment or disposal facilities would take place; however, this alternative would allow for expansion and upgrade of existing LLMW storage facilities to meet waste load requirements. The No Action Alternative does not ensure that existing and proposed action plans drafted by the various DOE sites for disposing of on-site LLMW are adequate; it represents the minimal-action bounding scenario for LLMW management.

Currently, only seven sites have adequate waste treatment capabilities to process certain LLMW streams through to a form ready for disposal. The WM PEIS assesses the impacts of LLMW treatment/disposal for the No Action Alternative at the following four sites: INEL, ORR, RFETS, and SRS. The existing treatment facilities at LANL and LBL have not been assessed because the waste throughput at these facilities is negligible. The existing facilities at Hanford are designed to process tank wastes that are no longer classified as LLMW. A description of existing LLMW treatment capabilities is given in Chapter 5.

For sites with no current LLMW treatment capability, all wastes would be placed in long-term monitored storage. In the West, such storage would be belowgrade. For eastern sites, aboveground storage vaults would be used, except at SRS. At SRS, waste would continue to be stored in belowgrade vaults.

The annual generation of LLMW for the sites under the No Action Alternative are the same as those given for Case 2a (see Table 3.3).

3.3.2 Decentralized Alternative: Case 2a

The Decentralized Alternative would involve minimal waste consolidation prior to treatment. Aqueous liquids would be treated on-site at all generator locations. Residues generated from aqueous liquid treatment would then be sent for further treatment and/or disposal, according to the waste routing developed under Case 2a.

Case 2a proposes CH LLMW treatment at 43 sites and disposal at 16 sites. In effect, for most sites, treatment would be performed on-site. Only two sites (NTS and UofMO) with limited amounts of waste and/or special wastes are not planned to have any treatment capabilities. These sites would ship to designated sites for treatment and disposal. The 16 sites designated for disposal of LLMW are ANL-E, BNL, FEMP, Hanford, INEL, LANL, LLNL, NTS (alpha waste only), ORR, Pantex, PGDP, PORTS, RFETS, SNL-NM, SRS, and WVDP. The following 16 sites would treat and dispose of their own wastes and accept LLMW for disposal from other designated sites:

1. ANL-E — treat and dispose of on-site waste and dispose of wastes from Ames, Site A, and Fermi.

2. BNL — treat and dispose of on-site waste only.

3. FEMP — treat and dispose of on-site waste only.

4. Hanford — treat and dispose of on-site waste and dispose of wastes from Puget So and Pearl H.

5. INEL — treat and dispose of on-site waste and wastes from NTS and ANL-W.

6. LANL — treat and dispose of on-site waste and dispose of waste from ITRI (alpha).

7. LLNL — treat and dispose of on-site waste and SNL-CA waste and dispose of wastes from GE, LBL (non-alpha), LEHR, SLAC, Mare Is, ETEC, and GA.

8. NTS — dispose of wastes from LBL (alpha) and LLNL (alpha).

9. ORR — treat and dispose of on-site waste and wastes from K-25 and Y-12.

10. Pantex — treat and dispose of on-site waste only.

11. PGDP — treat and dispose of on-site waste and dispose of waste from KCP.

12. PORTS — treat and dispose of on-site waste and dispose of wastes from Mound (non-alpha), BCL, and RMI.

13. RFETS — treat and dispose of on-site waste and dispose of waste from GJPO.

14. SNL-NM — treat and dispose of on-site waste and dispose of waste from ITRI (non-alpha).

15. SRS — treat and dispose of on-site waste and wastes from Mound (alpha), Bettis (alpha), WVDP (alpha), and UofMO (alpha), and dispose of wastes from Norfolk, Charleston, and Pinellas.

16. WVDP — treat and dispose of on-site waste and dispose of wastes from KAPL-S, KAPL-K, KAPL-W, PPPL, Ports Nav, Colonie, and Bettis (non-alpha).

WSSR and Middlesex LLMW would remain on-site for treatment and disposal and are not analyzed in this report.

Table 3.3 contains the annual CH non-alpha LLMW throughput volumes for treatment and disposal under Case 2a. The CH alpha LLMW volumes for treatment and disposal under Case 2a are given in Table 3.4.

3.3.3 Regionalized Alternative: Cases 4, 7, 10a, and 15

The Regionalized Alternative covers Cases 4, 7, 10a, and 15 and would require shipment of CH LLMW to designated regional sites around the country for treatment and disposal. This alternative represents intermediate choices between the Decentralized and Centralized Alternatives and is intended to provide optimal economies of scale in the construction of the treatment facilities and in balancing of worker and transportation-related risks. This alternative would significantly reduce the amount of shipping compared with the centralized scenario. Shipping across state lines might require full characterization of the waste packages and could incur high characterization costs. The residues from on-site aqueous liquid treatment would follow the same disposal routine as other LLMW in Case 7, except as noted.

3.3.3.1 Case 4 — 11 Sites Treat and 12 Sites Dispose

Case 4 designates 11 primary sites for treatment, with separate on-site treatment at ETEC. These 12 sites generate 99% of the total volume of LLMW. Treatment of LLMW at these sites would minimize environmental and health risks associated with waste shipment. The base option, as discussed in Section 3.1.2, is used. The sites designated for disposal of LLMW are the same as in Case 2a, except four sites — ANL-E, BNL, SNL-NM, and WVDP — were eliminated because they do not have waste disposal capability. The designated sites would treat and dispose of LLMW and accept waste from other sites, as follows:

1. ETEC — treat on-site waste.

2. FEMP — treat and dispose of on-site waste only; treat wastes from Ames, ANL-E, Fermi, and Mound; ship treated wastes to PORTS for disposal.

3. Hanford — treat and dispose of on-site waste and wastes from Puget So and Pearl H.

4. INEL — treat and dispose of on-site waste and wastes from ANL-W and NTS.

5. LANL — treat and dispose of on-site waste and wastes from SNL-NM and ITRI (alpha and non-alpha).

6. LLNL — treat and dispose of on-site waste and wastes from SNL-CA, GA, GE, LBL (non-alpha), LEHR, SLAC, and Mare Is; treat wastes from LLNL (alpha) and LBL (alpha); dispose of alpha waste at NTS; dispose of waste from ETEC.

7. NTS — ship on-site waste to INEL for treatment; dispose of wastes from LLNL (alpha) and LBL (alpha).

8. ORR — treat and dispose of on-site waste and wastes from K-25 and Y-12.

9. Pantex — treat and dispose of on-site waste only.

10. PGDP — treat and dispose of on-site waste and KCP waste.

11. PORTS — treat and dispose of on-site waste and wastes from RMI, Bettis (non-alpha), KAPL-S, KAPL-K, KAPL-W, WVDP (non-alpha), BNL, Ports Nav, PPPL, Colonie, Site A; dispose of wastes from Ames, ANL-E, Fermi, and Mound (non-alpha).

12. RFETS — treat and dispose of on-site waste and GJPO waste.

13. SRS — treat and dispose of on-site waste and wastes from Norfolk, Charleston, Pinellas, Bettis (alpha), UofMO (alpha), Mound (alpha), and WVDP (alpha).

Table 3.5 provides the annual CH non-alpha LLMW throughput volumes for treatment and disposal under Case 4. The CH alpha LLMW volumes for Case 4 are given in Table 3.4.

3.3.3.2 Case 7 — 7 Sites Treat and 6 Sites Dispose

The seven sites designated for treatment are Hanford, INEL, LANL, ORR, PORTS, RFETS, and SRS. The six sites designated for disposal are Hanford, INEL, LANL, NTS

(aqueous treatment residues only), ORR, and SRS. The configurations for treatment and disposal are provided as follows:

1. Hanford — treat and dispose of on-site waste and wastes from Puget So, Pearl H, LLNL, SNL-CA, GE, LBL, LEHR, SLAC, and Mare Is.

2. INEL — treat and dispose of on-site waste and wastes from ANL-W, NTS, LLNL (alpha), LBL (alpha), GA, and ETEC.

3. LANL — treat and dispose of on-site waste and wastes from SNL-NM, ITRI, and Pantex; dispose of wastes from RFETS, GJPO, and KCP.

4. NTS — dispose of aqueous treatment residues from ETEC, GA, LLNL, SNL-NM, GE, LBL, LEHR, Mare Is, and SLAC.

5. ORR — treat and dispose of on-site waste and wastes from K-25, Y-12, and PGDP; dispose of wastes from PORTS, BCL, RMI, Bettis (non-alpha), WVDP (non-alpha), BNL, PPPL, Ports Nav, Ames, ANL-E, Fermi, Mound (non-alpha), FEMP, Colonie, Site A, and KCP (aqueous treatment residue).

6. PORTS — treat, and ship to ORR for disposal, on-site waste and wastes from BCL, RMI, WVDP (non-alpha), BNL, PPPL, Ports Nav, Ames, ANL-E, Fermi, Mound (non-alpha), FEMP, Colonie, Bettis (non-alpha), KAPL-S, KAPL-K, and KAPL-W.

7. RFETS — treat on-site waste and wastes from GJPO and KCP; dispose of wastes at LANL.

8. SRS — treat and dispose of on-site waste and wastes from Norfolk, Charleston, Pinellas, Mound (alpha), WVDP (alpha), Bettis (alpha), and UofMO (alpha).

Table 3.6 contains the annual CH non-alpha LLMW throughput volumes for treatment and disposal under Case 7. The CH alpha LLMW volumes for Case 7 are given in Table 3.7.

3.3.3.3 Case 10a — 7 Sites Treat and 1 Site Disposes

The treatment routing for Case 10a is the same as for Case 7. Disposal of all CH LLMW is limited to the NTS site only. This includes all residue from treated aqueous liquids. WSSR and Middlesex LLMW are treated and disposed of on-site.

Table 3.6 contains the annual CH non-alpha LLMW throughput volumes for treatment and disposal under Case 10a. The CH alpha LLMW volumes for Case 10a are given in Table 3.7.

3.3.3.4 Case 15 — 4 Sites Treat and 6 Sites Dispose

The four sites designated for treatment under Case 15 are Hanford, INEL, ORR, and SRS. This scheme was chosen on the basis of the size of the sites, their treatment and disposal facilities, and the large quantities of LLMW generated at each site. The six sites designated for disposal are Hanford, INEL, LANL, NTS, ORR, and SRS.

The configurations for treatment and disposal are as follows:

1. Hanford — treat and dispose of on-site waste and wastes from LEHR, LBL (non-alpha) LLNL (non-alpha), SNL-CA, Mare Is, Pearl H, Puget So, GE, and SLAC.

2. INEL — treat and dispose of on-site waste and wastes from ANL-W, ETEC, GA, GJPO, ITRI, LANL, SNL-NM, LBL (alpha), LLNL (alpha), NTS, Pantex, and RFETS.

3. LANL — dispose of on-site aqueous residue and aqueous residues from SNL-NM, ITRI, Pantex, RFETS, and GJPO.

4. NTS — dispose of aqueous treatment residues from ETEC, GA, LLNL, LBL, SNL-CA, GE, LEHR, Mare Is, and SLAC.

5. ORR — treat and dispose of on-site waste and wastes from K-25, Y-12, ANL-E, Fermi, Ames, Site A, BCL, BNL, Bettis (non-alpha), Colonie, FEMP, KAPL-S, KAPL-K, KAPL-W, Mound (non-alpha), PGDP, Ports Nav, PORTS, PPPL, RMI, and WVDP (non-alpha).

6. SRS — treat and dispose of on-site waste and wastes from Bettis (alpha), Mound (alpha), Charleston, UofMO, Norfolk, Pinellas, and WVDP (alpha).

Table 3.8 contains the CH non-alpha LLMW volumes for treatment and disposal under Case 15. The CH alpha LLMW volumes for Case 15 are given in Table 3.9.

3.3.4 Centralized and RH Treatment Alternatives: Cases 17 and 26

3.3.4.1 Centralized Alternative: Case 17 — 1 Site Treats and Disposes

Case 17 represents the bounding case whereby all CH LLMW would be treated and disposed of at only one site. It is not deemed a likely scenario because of the complexities of the state waste disposal regulations and the risks involved with large-scale waste shipment. Hanford is designated for both treatment and disposal of all alpha and non-alpha

CH LLMW under Case 17. WSSR and Middlesex LLMW would be treated and disposed of on-site. Table 3.10 lists the CH non-alpha LLMW volumes for treatment and disposal under Case 17.

3.3.4.2 RH-Treatment Alternative: Case 26 — 4 Sites Treat and Dispose

Under Case 26, RH LLMW is designated for both on-site treatment and disposal at Hanford, INEL, ORR, and SRS because almost all RH LLMW is generated at these four sites. Bettis generates a minute amount (less than 0.1%) of the RH LLMW and would ship this waste to ORR for treatment and disposal. Table 3.11 lists the RH LLMW volumes for Case 26.

3.3.5 Other Wastes

Waste stream treatment codes 24 to 32 contain relatively small amounts of various types of toxic materials categorized as LLMW. Table 3.12 lists the annual volumes of these "other" LLMW under Case 2a. Approximately 80% of these other wastes (1,650 m^3/yr) are treated wastes that are currently in interim storage as final forms (grout) awaiting disposal. The remaining amount of "other waste" represents less than 1% of the total amount of LLMW. Although analysis for emissions from these "other wastes" has not yet been carried out, their impact on environmental health and safety is expected to be about 1% of the total impact from LLMW.

Treatment and disposal of other wastes (codes 24 to 32) is not addressed in this section. Table 3.12 contains the annual volumes for other LLMW under Case 2a.

3.3.6 PCB Treatment Alternatives

The PCB-contaminated LLMW would be processed according to the same treatment and disposal routing described for the equivalent LLMW outlined for Cases 1 through 17. The annual PCB waste volumes are summarized in Tables 3.13 and 3.14 for Case 2a; the PCB waste volumes for the other cases can be constructed from the information given in these tables.

3.3.7 Disposal Volumes for Each Alternative

Table 3.15 lists, for each alternative, the total amount of waste LLMW to be disposed of at each disposal site.

TABLE 3.1 Classification of LLMW

Waste Stream		
MWIR-2 Category	WM PEIS Code	Waste Description
1000	1, 2	Aqueous liquids
2000	3 to 6	Organic liquids
3000	7 to 12, 13[a]	Solid process residues
4000	15, 16	Soils
5000	17 to 20	Debris
6000	21 to 23	Lab packs
7000	24 to 33	Inherently hazardous

[a] Treatment code 14 has been incorporated into code 13.

TABLE 3.2 Treatment/Disposal Routing for LLMW Alternatives[a]

Originating Site	Case 2a		Case 4		Case 7		Case 10a		Case 15		Case 17	
	Treatment (43)	Disposal (16)	Treatment (11)	Disposal (12)	Treatment (7)	Disposal (6)	Treatment (7)	Disposal (1)	Treatment (4)	Disposal (6)	Treatment (1)	Disposal (1)
					MWIR-2 — Non-PCB-Contaminated LLMW							
Ames	Ames	ANL-E	FEMP	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
ANL-E	ANL-E	ANL-E	FEMP	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
BCL	BCL	PORTS	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Bettis	Bettis	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Bettis[b]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
Bettis[c]	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR
BNL	BNL	BNL	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Charleston	Charleston	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
Colonie	Colonie	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
ETEC	ETEC	LLNL	ETEC	LLNL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
FEMP	FEMP	FEMP	FEMP	FEMP	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
GA	GA	LLNL	LLNL	LLNL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
GJPO	GJPO	RFETS	RFETS	RFETS	RFETS	LANL	RFETS	NTS	INEL	INEL	Hanford	Hanford
Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
Hanford[b]	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
Hanford[c]	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford
INEL[d]	INEL	INEL	INEL	INEL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
INEL[b]	INEL	INEL	INEL	INEL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
INEL[c]	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL
INEL[e]	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL	INEL
ITRI	ITRI	SNL-NM	LANL	LANL	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
ITRI[b]	LANL	LANL	LANL	LANL	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
KAPL-K	KAPL-K	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
KAPL-S	KAPL-S	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
KAPL-W	KAPL-W	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
KCP	KCP	PGDP	PGDP	PGDP	RFETS	LANL	RFETS	NTS	ORR	ORR	Hanford	Hanford
LANL	LANL	LANL	LANL	LANL	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
LANL[b]	LANL	LANL	LANL	LANL	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
LBL	LBL	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
LBL[b]	LLNL	NTS	LLNL	NTS	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
LEHR	LEHR	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
LLNL[f]	LLNL	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
LLNL[b]	LLNL	NTS	LLNL	NTS	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford

TABLE 3.2 (Cont.)

Originating Site	Case 2a Treatment (43)	Case 2a Disposal (16)	Case 4 Treatment (11)	Case 4 Disposal (12)	Case 7 Treatment (7)	Case 7 Disposal (6)	Case 10a Treatment (7)	Case 10a Disposal (1)	Case 15 Treatment (4)	Case 15 Disposal (6)	Case 17 Treatment (1)	Case 17 Disposal (1)
					MWIR-2 — Non-PCB-Contaminated LLMW (Cont.)							
Mare Is	Mare Is	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
Middlesex					Waste treatment and disposal on-site							
Mound	Mound	PORTS	FEMP	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Mound[b]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
Norfolk	Norfolk	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
NTS	INEL	INEL	INEL	INEL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
ORR[g]	ORR	ORR	ORR	ORR	ORR	ORR	ORR	NTS	ORR	ORR	Hanford	Hanford
ORR[c]	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR	ORR
Pantex	Pantex	Pantex	Pantex	Pantex	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
Pearl H	Pearl H	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
PGDP	PGDP	PGDP	PGDP	PGDP	ORR	ORR	ORR	NTS	ORR	ORR	Hanford	Hanford
Pinnellas	Pinnellas	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
PORTS	PORTS	PORTS	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Ports Nav	Ports Nav	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
PPPL	PPPL	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Puget So	Puget So	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
RFETS[b]	RFETS	RFETS	RFETS	RFETS	RFETS	LANL	RFETS	NTS	INEL	INEL	Hanford	Hanford
RMI	RMI	PORTS	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
SNL-NM	SNL-NM	SNL-NM	LANL	LANL	LANL	LANL	LANL	NTS	INEL	INEL	Hanford	Hanford
SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
SRS[b]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
SRS[c]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS	SRS
UofMO[b]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
WSSR					Waste treatment and disposal on-site							
WVDP	WVDP	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
WVDP[b]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford

TABLE 3.2 (Cont.)

Originating Site	Case 2a Treatment (43)	Case 2a Disposal (16)	Case 4 Treatment (11)	Case 4 Disposal (12)	Case 7 Treatment (7)	Case 7 Disposal (6)	Case 10a Treatment (7)	Case 10a Disposal (1)	Case 15 Treatment (4)	Case 15 Disposal (6)	Case 17 Treatment (1)	Case 17 Disposal (1)
MWIR-2 — PCB-Contaminated LLMW												
Bettis[h]	Bettis	WVDP	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Charleston[h]	Charleston	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
FEMP[h]	FEMP	FEMP	FEMP	FEMP	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Hanford[h]	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
INEL[h]	INEL	INEL	INEL	INEL	INEL	INEL	INEL	NTS	INEL	INEL	Hanford	Hanford
Mound[h]	Mound	PORTS	FEMP	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Mound[i]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
ORR[h]	ORR	ORR	ORR	ORR	ORR	ORR	ORR	NTS	ORR	ORR	Hanford	Hanford
PORTS[h]	PORTS	PORTS	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
Puget So[h]	Puget So	Hanford	Hanford	Hanford	Hanford	Hanford	Hanford	NTS	NTS	Hanford	Hanford	Hanford
WSSR[h]	Waste treatment and disposal on-site											
WVDP[i]	SRS	SRS	SRS	SRS	SRS	SRS	SRS	NTS	SRS	SRS	Hanford	Hanford
Potential LLMW Sites Not Currently Listed in MWIR-2												
Fermi	Fermi	ANL-E	FEMP	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
GE	GE	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford
Site A	Site A	ANL-E	PORTS	PORTS	PORTS	ORR	PORTS	NTS	ORR	ORR	Hanford	Hanford
SLAC	SLAC	LLNL	LLNL	LLNL	Hanford	Hanford	Hanford	NTS	Hanford	Hanford	Hanford	Hanford

[a] The number of treatment and disposal sites is indicated in parentheses. Non-alpha waste would be treated at the originating site for Case 2a, unless otherwise indicated. Aqueous liquid wastes would be treated on-site for all cases. The aqueous waste treatment residues would be disposed of according to the above-listed routing for all cases except the following: under Cases 7 and 15, aqueous treatment residues from ETEC, GA, LLNL, SNL-CA, GE, LBL, LEHR, Mare Is, SLAC, and NTS would be shipped to NTS for disposal; under Case 15, aqueous treatment residues from LANL, SNL-NM, ITRI, Pantex, RFETS, and GJPO would be disposed of at LANL; under Case 7, aqueous treatment residues from KCP would be disposed of at ORR.

[b] CH alpha LLMW.

[c] RH non-alpha LLMW.

[d] INEL includes ANL-W.

[e] RH alpha LLMW.

[f] LLNL includes SNL-CA.

[g] ORR includes K-25, Y-12, and ORNL.

[h] PCB LLMW.

[i] PCB alpha LLMW.

TABLE 3.3 Volumes of CH Non-Alpha LLMW from MWIR-2 for Case 2a[a]

Waste Stream		Volume Generated (m^3/yr)			Volume Generated at LANL (m^3/yr)	Volume Generated (m^3/yr)	
MWIR-2 Category	WM PEIS Code	ANL-W[b]	INEL	NTS		ITRI	SNL-NM
1000							
Aqueous	1	-	13.1	65.2	4.19	-	-
	2	-	0.332	-	-	-	-
Total: Aqueous		-	13.4	65.2	4.19	-	-
2000							
Organic liquids	3	0.0004	0.2	-	-	-	0.0003
	4	0.0004	0.186	0.02	7.34	0.107	0.0003
	5	0.0004	0.83	-	-	-	-
	6	0.0004	2.49	-	-	-	-
3000							
Solid process residues	7	0.385	32.3	-	-	-	-
	8	-	1.48	26.0	-	-	-
	9	-	-	-	3.49	-	-
	10	-	0.952	-	-	-	-
	11	-	0.863	-	-	-	-
	12	-	0.006	0.15	-	-	-
	13	-	-	-	-	-	-
4000							
Soils	15	-	2.95	209	-	-	-
	16	-	-	-	-	-	-
5000							
Metal debris	17	-	10.6	-	6.94	-	0.002
	18	-	0.324	-	12.8	-	-
	19	0.232	2.7	-	-	-	2.35
	20	0.806	54	-	2.63	-	3.86
6000							
Lab packs	21	-	0.021	-	0.0054	-	0.0015
	22	-	0.059	-	0.328	-	0.0017
	23	-	0.585	-	0.0054	-	0.0015
Other (see Table 3.12)	24-33	0.54	57.3	0.49	0.5	3.38	0.352
Total: Nonaqueous		1.96	168	236	34.1	3.49	6.56
Total: All		1.96	181	301	38.3	3.49	6.56

	Volume after Treatment (m^3/yr)				LANL[d] Volume after Treatment (m^3/yr)	Volume after Treatment (m^3/yr)		
Treated Waste for Disposal	ANL-W[b]	INEL	NTS	Total[c] (INEL)		ITRI	SNL-NM	Total[c] (SNL-NM)
Polymer grout	0.019	4.38	13.43	17.8	3.18	0.00306	0.11	0.113
Grout cement	0.449	37.8	0.0059	38.2	7.94	0.0117	1.28	1.3
Mercury solids	0.00024	0.0119	0.000097	0.0121	0.00042	<0.00001	0.0015	0.0015

TABLE 3.3 (Cont.)

Waste Stream		Volume Generated (m^3/yr)								
MWIR-2 Category	WM PEIS Code	ETEC	LEHR	GA	LBL	LLNL	Mare Is	GE[e]	SLAC[e]	SNL-CA
1000										
Aqueous	1	-	-	2.52	-	-	-	-	-	-
	2	-	0.056	-	-	-	-	-	-	-
Total: Aqueous		-	0.056	2.52	-	-	-	-	-	-
2000										
Organic liquids	3	0.0037	0.0014	0.0386	-	42.2	-	-	-	-
	4	0.0037	0.0014	0.0386	-	42.2	-	-	-	-
	5	-	0.0014	0.0001	-	-	-	-	-	-
	6	-	0.0014	0.0001	0.38	-	-	-	-	9.02
3000										
Solid process residues	7	0.45	-	0.272	-	5.85	1.05	-	-	0.8
	8	-	-	0.208	-	74.1	-	-	-	0.066
	9	-	-	0.0002	-	-	-	-	-	0.066
	10	-	-	0.0002	-	-	0.085	-	-	0.066
	11	-	-	-	-	-	-	-	-	-
	12	-	0.286	-	-	0.585	-	-	-	-
	13	-	-	-	-	-	-	-	-	-
4000										
Soils	15	120	-	-	-	7.8	-	-	-	-
	16	-	-	-	-	-	-	-	-	-
5000										
Metal debris	17	-	-	0.063	-	-	0.04	-	-	-
	18	-	-	-	-	-	2.17	-	-	-
	19	0.12	0.3	-	-	-	1.86	-	-	-
	20	0.62	-	1.02	8.08	5.85	-	-	-	-
6000										
Lab packs	21	-	-	-	1.17	0.361	-	-	-	0.819
	22	-	-	-	1.20	0.361	-	-	-	-
	23	-	-	-	0.22	0.361	-	-	-	-
Other (see Table 3.12)	24-33	3.8	0.2	0.166	17.1	6.9	-	-	-	0.502
Total: Nonaqueous		125	0.792	1.81	28.1	187	5.2	-	-	11.3
Total: All		125	0.848	4.33	28.1	187	5.2	-	-	11.3

	Volume after Treatment (m^3/yr)									
Treated Waste for Disposal	ETEC	LEHR	GA	LBL	LLNL	Mare Is	GE[e]	SLAC[e]	SNL-CA[f]	Total[c] (LLNL)
Polymer grout	0.852	0.0955	0.522	0.124	21.4	0.0786	-	-	-	23.0
Grout cement	94.87	0.102	0.485	2.11	54.2	2.05	-	-	-	154
Mercury solids	0.00265	0.00019	0.00018	0.00065	0.0254	0.00115	-	-	-	0.0298

TABLE 3.3 (Cont.)

Waste Stream		Volume Generated at FEMP (m^3/yr)	Volume Generated (m^3/yr)				Volume Generated at BNL (m^3/yr)
MWIR-2 Category	WM PEIS Code		ANL-E	Ames	Fermi[e]	Site A[e]	
1000							
Aqueous	1	74	2.0	0.0152	-	-	-
	2	0.632	-	0.001	-	-	-
Total: Aqueous		74.6	2.0	0.0162	-	-	-
2000							
Organic liquids	3	0.161	-	-	-	-	0.49
	4	2.9	-	-	-	-	0.49
	5	9.43	-	-	-	-	0.37
	6	10.4	-	-	-	-	0.37
3000							
Solid process residues	7	40.7	-	-	-	-	0.0401
	8	51.9	2.01	-	-	-	15.4
	9	15.7	-	-	-	-	-
	10	10.9	-	-	-	-	0.602
	11	-	-	-	-	-	-
	12	30.1	-	-	-	-	-
	13	-	-	-	-	-	-
4000							
Soils	15	0.54	1.00	-	-	-	-
	16	0.18	-	-	-	-	-
5000							
Metal debris	17	0.882	0.41	-	-	-	-
	18	4.89	0.21	-	-	-	-
	19	2.19	0.37	-	-	-	-
	20	6.61	-	-	-	-	-
6000							-
Lab packs	21	0.04	0.31	-	-	-	-
	22	-	0.22	-	-	-	-
	23	-	-	0.025	-	-	0.817
Other (see Table 3.12)	24-33	0.75	8.9	0.015	-	-	0.488
Total: Nonaqueous		188	13.9	0.04	-	-	19.1
Total: All		263	15.9	0.0562	-	-	19.1

Treated Waste for Disposal	FEMP[d] Volume after Treatment (m^3/yr)	Volume (m^3/yr) after Treatment					BNL[d] Volume after Treatment (m^3/yr)
		ANL-E	Ames	Fermi[e]	Site A[e]	Total[c] (ANL-E)	
Polymer grout	42.2	0.51	0.00457	-	-	0.51	0.81
Grout cement	65.4	2.47	0.00574	-	-	2.47	7.6
Mercury solids	0.0303	0.001	<0.0001	-	-	0.001	0.00478

TABLE 3.3 (Cont.)

Waste Stream		Volume Generated (m^3/yr)				Volume Generated (m^3/yr)						
MWIR-2 Category	WM PEIS Code	BCL	Mound	PORTS	RMI	Bettis	Colonie	KAPL-S	KAPL-K	KAPL-W	Ports Nav	PPPL
1000												
Aqueous	1	-	-	77.3	0.04	-	-	-	-	-	-	-
	2	-	-	22.8	0.55	-	0.086	-	-	-	-	-
Total: Aqueous		-	-	100	0.59	-	0.086	-	-	-	-	-
2000												
Organic liquids	3	-	-	7.85	-	-	0.233	0.172	0.132	0.018	-	-
	4	-	-	42.5	-	-	0.304	0.172	0.132	0.018	-	-
	5	-	-	-	0.68	0.0002	0.235	0.172	0.132	0.018	-	-
	6	-	-	0.01	0.06	0.0752	0.232	0.172	0.132	0.018	-	-
3000												
Solid process residues	7	-	-	54.7	0.17	0.0223	-	0.062	0.04	0.01	0.08	-
	8	-	-	133	-	0.0026	-	0.032	0.04	0.01	-	-
	9	-	-	-	0.34	0.0013	-	0.032	0.04	0.01	-	-
	10	-	-	-	-	-	-	0.032	0.04	0.01	0.021	-
	11	-	-	52.9	-	0.714	-	0.04	0.42	0.1	-	-
	12	-	-	11.3	-	-	-	0.04	0.42	0.1	-	-
	13	-	-	-	-	-	-	0.04	0.42	0.1	-	-
4000												
Soils	15	-	-	0.791	-	0.239	-	2.24	2.66	0.42	-	-
	16	-	-	0.791	-	-	-	2.24	2.66	0.42	-	-
5000												
Metal debris	17	-	-	5.07	-	-	-	-	0.042	-	-	-
	18	-	-	-	0.04	-	-	0.02	-	-	-	-
	19	-	-	34.8	1.03	0.25	-	1.21	0.16	0.525	-	-
	20	-	-	2,280	-	0.021	-	0.221	1.82	1.16	-	-
6000												
Lab packs	21	0.0044	-	-	-	-	-	0.256	0.21	0.017	-	0.0016
	22	-	-	-	-	-	-	0.256	0.21	0.017	-	-
	23	-	-	8.35	-	-	-	-	-	-	-	-
Other (see Table 3.12)	24-33	0.0141	0.0022	30.5	-	1.54	-	0.666	0.61	1.02	0.02	-
Total: Nonaqueous		0.0185	0.0022	2,660	2.32	2.86	1.0	8.33	10.5	4.0	0.121	0.0016
Total: All		0.0185	0.0022	2,760	2.91	2.86	1.09	8.33	10.5	4.0	0.121	0.0016

	Volume after Treatment (m^3/yr)					Volume after Treatment (m^3/yr)							
Treated Waste for Disposal	BCL	Mound	PORTS	RMI	Total[c] (PORTS)	Bettis	Colonie	KAPL-S	KAPL-K	KAPL-W	Ports Nav	PPPL	Total[c] (WVDP)
Polymer grout	0.00016	-	46.6	0.898	47.5	0.244	0.33	0.399	0.513	0.118	0.00092	0.00006	1.6
Grout cement	0.001	-	532	0.596	532	0.311	0.129	3.45	3.99	0.909	0.0656	0.00035	8.85
Mercury solids	-	-	0.25	0.00082	0.25	0.0003	0.00009	0.00145	0.00124	0.00053	0.00002	-	0.0034

TABLE 3.3 (Cont.)

Waste Stream		Volume Generated at ORR (m^3/yr)	Volume Generated (m^3/yr)		Volume Generated (m^3/yr)		
MWIR-2 Category	WM PEIS Code		KCP	PGDP	Pearl H	Puget So	Hanford
1000							
Aqueous	1	84.2	-	0.18	-	-	-
	2	39	-	1.24	-	-	-
Total: Aqueous		123	-	1.42	-	-	-
2000							
Organic liquids	3	285	-	2.71	0.002	-	-
	4	300	-	2.71	-	-	-
	5	354	-	14.1	-	0.044	-
	6	278	-	14.1	-	-	-
3000							
Solid process residues	7	53.3	-	0.391	0.2	-	355
	8	2,040	-	2.19	-	-	437
	9	4.21	-	-	-	-	-
	10	4.21	-	-	0.183	3.79	-
	11	56.3	-	-	-	-	-
	12	10.3	-	-	-	-	0.19
	13	7.97	-	-	-	-	-
4000							
Soils	15	55.7	-	-	-	-	209
	16	599	-	-	-	-	638
5000							
Metal debris	17	0.38	0.034	0.167	-	-	-
	18	46.6	-	-	-	-	-
	19	227	0.047	-	0.103	2.09	-
	20	231	-	11.4	0.0598	10.7	920
6000							
Lab packs	21	1.75	-	0.055	-	-	366
	22	1.21	-	0.049	-	-	183
	23	1.43	-	0.049	-	-	146
Other (see Table 3.12)	24-33	40	-	3.3	0.008	-	210
Total: Nonaqueous		4,950	0.081	53.8	0.556	16.7	3,460
Total: All		4,710	0.081	55.2	0.556	16.7	3,460

Treated Waste for Disposal	ORR[d] Volume after Treatment (m^3/yr)	Volume after Treatment (m^3/yr)			Volume after Treatment (m^3/yr)			
		KCP	PGDP	Total[c] (PGDP)	Pearl H	Puget So	Hanford	Total[c] (Hanford)
Polymer grout	528	0.00163	14.2	14.2	0.00724	0.195	51.9	52.1
Grout cement	1,510	0.0192	7.46	7.48	0.293	5.14	1,190	1,200
Mercury solids	1.02	<0.0001	0.00578	0.0057	0.00011	0.00231	0.46	0.463

TABLE 3.3 (Cont.)

Waste Stream		Volume Generated (m^3/yr)				Volume Generated at GJPO (m^3/yr)	Volume Generated at Pantex (m^3/yr)	Total All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code	Charleston	Norfolk	Pinellas	SRS			
1000								
Aqueous	1	-	-	-	-	0.0701	-	256
	2	0.086	-	-	0.513	-	3.48	68.8
Total: Aqueous		0.086	-	-	0.513	0.0701	3.48	325
2000								
Organic liquids	3	0.233	-	-	0.199	0.0036	-	340
	4	0.304	-	-	0.199	0.0036	-	400
	5	0.235	-	-	267	0.0036	1.44	649
	6	0.232	-	-	266	0.0036	0.177	582
3000								
Solid process residues	7	0.02	0.4	0.08	2.53	0.002	2.61	553
	8	-	-	-	231	0.0015	-	3,170
	9	-	-	-	-	-	-	24
	10	-	-	0.02	0.0851	-	-	21
	11	-	-	-	-	-	-	111
	12	-	-	-	-	-	0.135	53.5
	13	-	-	-	-	-	-	8.53
4000								
Soils	15	-	-	-	-	0.0277	0.012	1,010
	16	-	-	-	-	0.0277	-	1,240
5000								
Metal debris	17	-	-	-	40.7	-	8.5	89.6
	18	-	-	-	29	-	2.01	98.1
	19	0.08	0.2	-	30.8	-	43.1	356
	20	0.024	-	-	30.1	-	3.21	3,570
6000								
Lab packs	21	-	-	-	0.004	-	2.25	374
	22	-	-	-	0.004	-	-	191
	23	-	-	-	0.004	-	-	158
Other (see Table 3.12)	24-33	0.254	-	0.02	33.7	0.0338	2.11	427
Total: Nonaqueous		1.38	0.6	0.12	932	0.107	65.5	13,437
Total: All		1.47	0.6	0.12	934	0.177	69	13,737

	Volume after Treatment (m^3/yr)					GJPO[g] Volume after Treatment (m^3/yr)	Pantex[d] Volume after Treatment (m^3/yr)
Treated Waste for Disposal	Charleston	Norfolk	Pinellas	SRS	Total[c] (SRS)		
Polymer grout	0.333	0.0114	-	246	246	0.0193	3.18
Grout cement	0.166	0.304	-	199	199	0.0381	17.1
Mercury solids	0.00014	0.00017	-	0.159	0.159	0.00001	0.024

See next page for footnotes.

TABLE 3.3 (Cont.)

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] ANL-W waste would be treated and disposed of at INEL.

[c] Treated wastes from the listed generating sites would be disposed of at the site listed in parentheses.

[d] This site would be both the treatment and disposal site for these wastes.

[e] Site currently not listed on MWIR-2.

[f] SNL-CA treated waste volumes are included in LLNL waste volumes.

[g] GJPO waste would be disposed of at RFETS.

TABLE 3.4 Volumes of CH Alpha LLMW from MWIR-2 for Cases 2a and 4[a]

Waste Stream		Volume Generated (m^3/yr)		Volume Generated (m^3/yr)			Volume Generated (m^3/yr)			
MWIR-2 Category	WM PEIS Code	ANL-W	INEL	ITRI	LANL	Total	LBL	LLNL	SNL-CA	Total
1000										
Aqueous	1	-	-	-	1.81	1.81	-	-	-	-
	2	-	0.59	-	-	-	-	-	-	-
Total: Aqueous		-	0.59	-	1.81	1.81	-	-	-	-
2000										
Organic liquids	3	-	-	-	40.5	40.5	-	25.1	-	25.1
	4	-	-	-	27.5	27.5	-	25.1	-	25.1
	5	-	-	-	-	-	-	6.55	-	6.55
	6	-	-	-	-	-	-	6.55	-	6.55
3000										
Solid process residues	7	-	106	-	-	-	-	-	-	-
	8	-	34.2	-	-	-	-	7.8	-	7.8
	9	-	1.36	-	-	-	-	-	-	-
	10	-	208	-	0.32	0.32	-	58.5	-	58.5
	11	-	-	-	-	-	-	-	-	-
4000										
Soils	15	-	-	-	-	-	-	0.39	-	0.39
	16	-	21.4	-	-	-	-	-	-	-
5000										
Metal debris	17	-	838	-	114	114	-	11.7	-	11.7
	18	-	36.2	-	-	-	-	-	-	-
	19	-	76.4	-	-	-	-	0.78	-	0.78
	20	-	789	-	13.5	13.5	-	48.8	-	48.8
6000										
Lab packs	21	-	-	-	0.332	0.332	-	-	-	-
	22	-	-	-	8.82	8.82	-	-	-	-
	23	-	-	-	0.332	0.332	-	-	-	-
Other (see Table 3.12)	24-33	-	351	0.145	5.84	5.98	0.44	5.85	-	6.29
Total: Nonaqueous		-	2,460	0.145	211	211	-	197	-	197
Total: All		-	2,460	0.145	213	213	0.44	197	-	197

Treated Waste for Disposal	INEL[b] Volume after Treatment (m^3/yr)	LANL[b] Volume after Treatment (m^3/yr)	LLNL[c] Volume after Treatment (m^3/yr)
Polymer grout	12.1	19.4	18.3
Grout cement	599	36.8	63.1
Mercury solids	0.155	0.00296	0.016

TABLE 3.4 (Cont.)

Waste Stream		Volume Generated at RFETS[a] (m^3/yr)	Hanford[d]	Volume Generated (m^3/yr)						Total All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code			Bettis	Mound	UofMO	SRS[b]	WVDP	Total	
1000										
Aqueous	1	4,750	-	-	-	-	-	0.076	0.076	4,750
	2	21.3	-	-	-	-	-	0.0497	0.0497	21.9
Total: Aqueous		4,770	-	-	-	-	-	0.126	0.126	4,770
2000										
Organic liquids	3	2.16	-	-	-	-	3.53	0.908	4.44	72.2
	4	2.16	-	-	-	-	3.53	0.944	4.47	59.2
	5	3.65	-	-	1.01	-	-	0.0711	1.08	11.3
	6	3.65	-	-	1.01	-	-	0.0159	1.02	11.2
3000										
Solid process residues	7	18	-	-	-	-	52.7	1.58	54.3	179
	8	0.432	-	-	-	-	-	-	-	42.5
	9	0.021	-	-	-	-	-	-	-	1.38
	10	1,810	-	-	-	-	-	-	-	2,080
	11	0.063	-	-	-	-	-	-	-	0.063
4000										
Soils	15	-	-	-	-	-	0.603	-	0.603	0.993
	16	119	-	-	-	-	0.603	-	0.603	141
5000										
Metal debris	17	23.8	-	-	-	-	-	-	-	987
	18	3.51	-	-	-	-	-	0.0033	0.0033	39.7
	19	1.41	-	1.09	0.002	-	-	-	1.09	79.7
	20	163	-	-	-	0.145	344	0.0089	344	1,360
6000										
Lab packs	21	3.71	-	-	0.0021	-	-	0.0038	0.0059	4.05
	22	3.71	-	-	0.0021	-	-	0.0888	0.0909	12.6
	23	3.71	-	-	0.0081	-	-	-	0.0081	4.05
Other (see Table 3.12)	24-33	10.9	-	-	4.92	-	-	0.269	5.18	379
Total: Nonaqueous		2,180	-	1.09	6.94	0.145	405	3.89	417	5,460
Total: All		6,940	-	1.09	6.94	0.145	405	4.02	417	10,200

Treated Waste for Disposal	RFETS[b] Volume after Treatment (m^3/yr)	Hanford[d] Volume after Treatment (m^3/yr)	SRS[b] Volume after Treatment (m^3/yr)	Total All Sites (m^3/yr)
Polymer grout	933	-	6.38	989
Grout cement	1,410	-	99.1	2,200
Mercury solids	0.266	-	0.0352	0.475

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] This site would be both the treatment and disposal site for these wastes.

[c] NTS would be the disposal site for this waste.

[d] Hanford has not reported alpha waste.

TABLE 3.5 Volumes of CH Non-Alpha LLMW from MWIR-2 for Case 4[a]

Waste Stream		Volume Generated (m^3/yr)				Volume Generated (m^3/yr)			
MWIR-2 Category	WM PEIS Code	ANL-W[b]	INEL	NTS	Total	ITRI	LANL	SNL-NM	Total
1000									
Aqueous	1	-	13.1	-	13.1	-	4.19	-	4.19
	2	-	0.332	-	0.332	-	-	-	-
Total: Aqueous		-	13.4	-	13.4	-	4.19	-	4.19
2000									
Organic liquids	3	0.0004	0.2	-	0.2	-	-	0.0003	0.0003
	4	0.0004	0.186	-	0.186	0.107	7.34	0.0003	7.45
	5	0.0004	0.834	-	0.835	-	-	-	-
	6	0.0004	2.49	-	2.49	-	-	-	-
3000									
Solid process residues	7	0.385	32.3	-	32.7	-	-	-	-
	8	-	1.48	-	1.48	-	-	-	-
	9	-	-	-	-	-	3.49	-	3.49
	10	-	0.952	-	0.952	-	-	-	-
	11	-	0.863	-	0.863	-	-	-	-
	12	-	0.006	0.0178	0.0238	-	-	-	-
	13	-	-	-	-	-	-	-	-
4000									
Soils	15	-	2.95	-	2.95	-	-	-	-
	16	-	-	-	-	-	-	-	-
5000									
Metal debris	17	-	10.6	-	10.6	-	6.94	0.002	6.94
	18	-	0.324	-	0.324	-	12.8	-	12.8
	19	0.232	2.7	-	2.93	-	-	2.35	2.35
	20	0.806	54	-	54.8	-	2.63	3.86	6.48
6000									
Lab packs	21	-	0.021	-	0.021	-	0.0054	0.0015	0.0069
	22	-	0.059	-	0.059	-	0.328	0.0017	0.33
	23	-	0.585	-	0.585	-	0.0054	0.0015	0.0069
Other (see Table 3.12)	24-33	0.54	57.3	0.0401	57.8	3.38	0.5	0.352	4.2
Total: Nonaqueous		1.96	168	0.0579	170	3.49	34.1	6.56	44
Total: All		1.96	181	0.0579	183	3.49	38.3	6.56	48

	Volume after Treatment (m^3/yr)				Volume after Treatment (m^3/yr)			
Treated Waste for Disposal	ANL-W[b]	INEL	NTS	Total[c] (INEL)	ITRI	LANL	SNL-NM	Total[c] (LANL)
Polymer grout	0.019	4.38	0.0050	4.41	0.0031	3.18	0.11	3.3
Grout cement	0.449	37.8	0.0086	38.3	0.0117	7.94	1.28	9.24
Mercury solids	0.00024	0.0119	<0.00001	0.0121	<0.00001	0.00042	0.0015	0.0019

TABLE 3.5 (Cont.)

Waste Stream		Volume Generated (m^3/yr)									
MWIR-2 Category	WM PEIS Code	ETEC[d]	LEHR	GA	LBL	LLNL	Mare Is	GE[e]	SLAC[e]	SNL-CA	Total
1000											
Aqueous	1	-	-	2.52	-	-	-	-	-	-	2.52
	2	-	0.056	-	-	-	-	-	-	-	0.056
Total: Aqueous		-	0.056	2.52	-	-	-	-	-	-	2.57
2000											
Organic liquids	3	0.0037	0.0014	0.0386	-	42.2	-	-	-	-	42.3
	4	0.0037	0.0014	0.0386	-	42.2	-	-	-	-	42.3
	5	-	0.0014	0.0001	-	-	-	-	-	-	0.0015
	6	-	0.0014	0.0001	0.38	-	-	-	-	9.02	9.4
3000											
Solid process residues	7	0.45	-	0.272	-	5.85	1.051	-	-	0.8	7.97
	8	-	-	0.208	-	74.1	-	-	-	0.066	74.4
	9	-	-	0.0002	-	-	-	-	-	0.066	0.0662
	10	-	-	0.0002	-	-	0.085	-	-	0.066	0.151
	11	-	-	-	-	-	-	-	-	-	-
	12	-	0.286	-	-	0.585	-	-	-	-	0.871
	13	-	-	-	-	-	-	-	-	-	-
4000											
Soils	15	120	-	-	-	7.8	-	-	-	-	7.8
	16	-	-	-	-	-	-	-	-	-	-
5000											
Metal debris	17	-	-	0.063	-	-	0.04	-	-	-	0.103
	18	-	-	-	-	-	2.17	-	-	-	2.17
	19	0.12	0.3	-	-	-	1.86	-	-	-	2.16
	20	0.62	-	1.02	8.08	5.85	-	-	-	-	15
6000											
Lab packs	21	-	-	-	1.17	0.361	-	-	-	0.819	2.35
	22	-	-	-	1.2	0.361	-	-	-	-	1.56
	23	-	-	-	0.22	0.361	-	-	-	-	0.581
Other (see Table 3.12)	24-33	3.8	0.2	0.166	17.1	6.9	-	-	-	0.502	24.8
Total: Nonaqueous		125	0.792	1.81	28.1	187	5.2	-	-	11.3	234
Total: All		125	0.848	4.33	28.1	187	5.2	-	-	11.3	237

	Volume after Treatment (m^3/yr)									
Treated Waste for Disposal	ETEC[d]	LEHR	GA	LBL	LLNL	Mare Is	GE[e]	SLAC[e]	SNL-CA[f]	Total[c] (LLNL)
Polymer grout	0.852	0.0955	0.522	0.124	21.4	0.0786	-	-	-	23
Grout cement	94.8	0.102	0.485	2.11	54.2	2.05	-	-	-	154
Mercury solids	0.00265	0.00019	0.00018	0.00065	0.0254	0.00115	-	-	-	0.0298

TABLE 3.5 (Cont.)

Waste Stream		Volume Generated (m^3/yr)					
MWIR-2 Category	WM PEIS Code	FEMP	ANL-E	Ames	Fermi[e]	Mound	Total[g]
1000							
Aqueous	1	74	0.262	0.0152	-	-	74.2
	2	0.632	-	0.001	-	-	0.633
Total: Aqueous		74.6	0.262	0.0162	-	-	74.9
2000							
Organic liquids	3	0.161	-	-	-	-	0.161
	4	2.9	-	-	-	-	2.9
	5	9.43	-	-	-	-	9.43
	6	10.4	-	-	-	-	10.4
3000							
Solid process residues	7	40.7	1.53	-	-	-	42.2
	8	51.9	191	-	-	-	243
	9	15.7	-	-	-	-	15.7
	10	10.9	-	-	-	-	10.9
	11	-	-	-	-	-	-
	12	30.1	-	-	-	-	30.1
	13	-	-	-	-	-	-
4000							
Soils	15	0.54	610	-	-	-	610
	16	0.18	-	-	-	-	0.18
5000							
Metal debris	17	0.882	16.2	-	-	-	17.1
	18	4.89	0.286	-	-	-	5.18
	19	2.19	4.16	-	-	-	6.35
	20	6.61	0.042	-	-	-	6.65
6000							
Lab packs	21	0.04	0.679	-	-	-	0.719
	22	-	3.49	-	-	-	3.49
	23	-	-	0.025	-	-	0.025
Other (see Table 3.12)	24-33	0.75	12.3	0.015	-	0.0022	13.1
Total: Nonaqueous		188	839	0.04	-	0.0022	1,030
Total: All		263	840	0.0562	-	0.0022	1,100

Treated Waste for Disposal	Volume after Treatment (m^3/yr)					
	FEMP	ANL-E	Ames	Fermi[e]	Mound	Total[g]
Polymer grout	42.2	6.914	0.00457	-	-	-
Grout cement	65.4	570	0.00574	-	-	-
Mercury solids	0.0303	0.0693	0.00001	-	-	-

TABLE 3.5 (Cont.)

Waste Stream		Volume Generated (m^3/yr)												
MWIR-2 Category	WM PEIS Code	BCL	BNL	Bettis	Colonie	KAPL-S	KAPL-K	KAPL-W	Ports Nav	PORTS	PPPL	RMI	Site A[e]	Total[h]
1000														
Aqueous	1	-	-	-	-	-	-	-	-	77.3	-	0.04	-	77.3
	2	-	-	-	0.086	-	-	-	-	22.8	-	0.55	-	23.4
Total: Aqueous		-	-	-	0.086	-	-	-	-	100	-	0.59	-	101
2000														
Organic liquids	3	-	0.49	-	0.233	0.172	0.132	0.018	-	7.85	-	-	-	8.9
	4	-	0.49	-	0.304	0.172	0.132	0.018	-	42.5	-	-	-	43.6
	5	-	0.37	0.0002	0.235	0.172	0.132	0.018	-	-	-	0.68	-	1.61
	6	-	0.37	0.0752	0.232	0.172	0.132	0.018	-	0.01	-	0.06	-	1.07
3000														
Solid process residues	7	-	0.0401	0.0223	-	0.062	0.04	0.01	0.08	54.7	-	0.17	-	55.1
	8	-	15.4	0.0026	-	0.032	0.04	0.01	-	133	-	-	-	148
	9	-	-	0.0013	-	0.032	0.04	0.01	-	-	-	0.34	-	0.423
	10	-	0.602	-	-	0.032	0.04	0.01	0.021	-	-	-	-	0.705
	11	-	-	0.714	-	0.04	0.42	0.1	-	52.9	-	-	-	54.2
	12	-	-	-	-	0.04	0.42	0.1	-	11.3	-	-	-	11.9
	13	-	-	-	-	0.04	0.42	0.1	-	-	-	-	-	0.56
4000														
Soils	15	-	-	0.239	-	2.24	2.66	0.42	-	0.791	-	-	-	6.35
	16	-	-	-	-	2.24	2.66	0.42	-	0.791	-	-	-	6.11
5000														
Metal debris	17	-	-	-	-		0.042	-	-	5.07	-	-	-	5.11
	18	-	-	-	-	0.02	-	-	-	-	-	0.04	-	0.06
	19	-	-	0.25	-	1.21	0.16	0.525	-	34.8	-	1.03	-	38
	20	-	-	0.021	-	0.221	1.822	1.16	-	2,280	-	-	-	2,280
6000														
Lab packs	21	0.0044	-	-	-	0.256	0.21	0.017	-	-	0.0016	-	-	0.489
	22	-	-	-	-	0.256	0.21	0.017	-	-	-	-	-	0.483
	23	-	0.817	-	-	0.256	0.21	0.017	-	8.35	-	-	-	9.65
Other (see Table 3.12)	24-33	0.0141	0.488	1.54	-	0.666	0.61	1.02	0.02	30.5	-	-	-	34.8
Total: Nonaqueous		0.0185	19.1	2.86	1	8.33	10.5	4	0.121	2,660	0.0016	2.32	-	2,710
Total: All		0.0185	19.1	2.86	1.09	8.33	10.5	4	0.121	2,760	0.0016	2.91	-	2,810

	Volume after Treatment (m^3/yr)												
Treated Waste for Disposal	BCL	BNL	Bettis	Colonie	KAPL-S	KAPL-K	KAPL-W	Ports Nav	PORTS	PPPL	RMI	Site A[e]	Total[h] (PORTS)
Polymer grout	0.00016	0.81	0.244	0.33	0.399	0.513	0.118	0.00092	46.6	0.00006	0.898	-	56.8
Grout cement	0.001	7.6	0.311	0.129	3.45	3.99	0.909	0.0656	532	0.00035	0.595	-	1,120
Mercury solids	-	0.00478	0.0003	0.00009	0.00145	0.00124	0.00053	0.00002	0.25	<0.00001	0.00082	-	0.328

TABLE 3.5 (Cont.)

Waste Stream		Volume Generated at ORR[1] (m^3/yr)	Volume Generated (m^3/yr)			Volume Generated (m^3/yr)			
MWIR-2 Category	WM PEIS Code		KCP	PGDP	Total	Pearl H	Puget So	Hanford	Total
1000									
Aqueous	1	84.2	-	0.18	0.18	-	-	-	-
	2	39	-	1.24	1.24	-	-	-	-
Total: Aqueous		123	-	1.42	1.42	-	-	-	-
2000									
Organic liquids	3	285	-	2.71	2.71	0.002	-	-	0.002
	4	300	-	2.71	2.71	-	-	-	-
	5	354	-	14.1	14.1	-	0.044	-	0.044
	6	278	-	14.1	14.1	-	-	-	-
3000									
Solid process residues	7	53.3	-	0.391	0.391	0.2	-	355	356
	8	2,040	-	2.19	2.19	-	-	437	437
	9	4.21	-	-	-	-	-	-	-
	10	4.21	-	-	-	0.183	3.79	-	3.98
	11	56.3	-	-	-	-	-	-	-
	12	10.3	-	-	-	-	-	0.19	0.19
	13	7.97	-	-	-	-	-	-	-
4000									
Soils	15	55.7	-	-	-	-	-	209	209
	16	599	-	-	-	-	-	638	638
5000									
Metal debris	17	0.38	0.034	0.167	0.201	-	-	-	-
	18	46.6	-	-	-	-	-	-	-
	19	227	0.047	-	0.047	0.103	2.09	-	2.19
	20	231	-	11.4	11.4	0.0598	10.7	920	931
6000									
Lab packs	21	1.75	-	0.055	0.055	-	-	366	366
	22	1.21	-	0.049	0.049	-	-	183	183
	23	1.43	-	0.049	0.049	-	-	-	-
Other (see Table 3.12)	24-33	40	-	3.3	3.3	0.008	-	210	210
Total: Nonaqueous		4,950	0.081	53.8	53.8	0.556	16.7	3,460	3,480
Total: All		4,710	0.081	55.2	55.2	0.556	16.7	3,460	3,480

Treated Waste for Disposal	ORR[1] Volume after Treatment (m^3/yr)	Volume after Treatment (m^3/yr)			Volume after Treatment (m^3/yr)			
		KCP	PGDP	Total[c] (PGDP)	Pearl H	Puget So	Hanford	Total[c] (Hanford)
Polymer grout	523	0.00163	14.2	14.2	0.00724	0.195	51.9	52.1
Grout cement	1,510	0.0192	7.46	7.4861	0.293	5.14	1,190	1,200
Mercury solids	1.02	0.00002	0.00578	0.0057	0.00011	0.00231	0.46	0.4630

TABLE 3.5 (Cont.)

Waste Stream		Volume Generated (m^3/yr)					Volume Generated at GJPO[j] (m^3/yr)	Volume Generated at Pantex[j] (m^3/yr)
MWIR-2 Category	WM PEIS Code	Charleston	Norfolk	Pinellas	SRS	Total		
1000								
Aqueous	1	-	-	-	-	-	0.0701	-
	2	0.086	-	-	0.513	0.599	-	3.48
Total: Aqueous		0.086	-	-	0.513	0.599	0.0701	3.48
2000								
Organic liquids	3	0.233	-	-	0.199	0.432	0.0036	-
	4	0.304	-	-	0.199	0.502	0.0036	-
	5	0.235	-	-	267	268	0.0036	1.44
	6	0.232	-	-	266	266	0.0036	0.177
3000								
Solid process residues	7	0.02	0.4	0.08	2.53	2.95	0.002	2.61
	8	-	-	-	231	231	0.0015	-
	9	-	-	-	-	-	-	-
	10	-	-	0.02	0.0851	0.0851	-	-
	11	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	0.135
	13	-	-	-	-	-	-	-
4000								
Soils	15	-	-	-	-	-	0.0277	0.012
	16	-	-	-	-	-	0.0277	-
5000								
Metal debris	17	-	-	-	40.7	40.7	-	8.5
	18	-	-	-	29	29	-	2.01
	19	0.08	0.2	-	30.8	31.1	-	43.1
	20	0.024	-	-	30.1	30.1	-	3.21
6000								
Lab packs	21	-	-	-	0.004	0.004	-	2.25
	22	-	-	-	0.004	0.004	-	-
	23	-	-	-	0.004	0.004	-	-
Other (see Table 3.12)	24-33	0.254	-	0.02	33.7	34	0.0338	2.11
Total: Nonaqueous		1.38	0.6	0.12	932	932	0.107	65.5
Total: All		1.47	0.6	0.12	934	936	0.177	69

	Volume after Treatment (m^3/yr)					GJPO[j] Volume after Treatment (m^3/yr)	Pantex[j] Volume after Treatment (m^3/yr)
Treated Waste for Disposal	Charleston	Norfolk	Pinellas	SRS	Total[c] (SRS)		
Polymer grout	0.333	0.0114	-	246	246	0.0193	3.18
Grout cement	0.166	0.304	-	199	199	0.0381	17.1
Mercury solids	0.00014	0.00017	-	0.159	0.16	0.00001	0.024

See next page for footnotes.

TABLE 3.5 (Cont.)

[a] A hyphen indicates that this site reports no waste in MWIR-2.

[b] ANL-W waste would be treated and disposed of at INEL.

[c] The site listed in parentheses would be both the treatment and disposal site for these wastes.

[e] Site currently not listed on MWIR-2.

[d] ETEC would treat its own waste and dispose of it at LLNL; therefore, the treatment total does not include the ETEC waste but the disposal total (at LLNL) does.

[e] Site currently not listed on MWIR-2.

[f] SNL-CA treated waste volumes are included in the LLNL waste volumes.

[g] FEMP would be the treatment site for these wastes. Volumes of polymer grout, grout cement, and mercury solids from ANL-E, Ames, and Mound wastes treated at FEMP are included in the totals for the waste to be disposed of at PORTS; FEMP would dispose of its own waste.

[h] PORTS would be both the treatment and disposal site for these wastes. Volumes of polymer grout, grout cement, and mercury solids from ANL-E, Ames, and Mound wastes treated at FEMP are included in the totals for the waste to be disposed of at PORTS.

[i] This site would be both the treatment and disposal site for these wastes.

[j] RFETS would be both the treatment and disposal site for these wastes.

TABLE 3.6 Volumes of CH Non-Alpha LLMW from MWIR-2 for Cases 7 and 10a[a,b]

Waste Stream		Volume Generated (m^3/yr)										
MWIR-2 Category	WM PEIS Code	LEHR	LBL	LLNL	Mare Is	GE[c]	Pearl H	Puget So	Hanford	SLAC[c]	SNL-CA	Total
1000												
Aqueous	1	-	-	-	-	-	-	-	-	-	-	-
	2	0.056	-	-	-	-	-	-	-	-	-	0.056
Total: Aqueous		0.056	-	-	-	-	-	-	-	-	-	0.056
2000												
Organic liquids	3	0.0014	-	42.2	-	-	0.002	-	-	-	-	42.2
	4	0.0014	-	42.2	-	-	-	-	-	-	-	42.2
	5	0.0014	-	-	-	-	-	0.044	-	-	-	0.0454
	6	0.0014	0.38	-	-	-	-	-	-	-	9.02	9.4
3000												
Solid process residues	7	-	-	5.85	1.05	-	0.2	-	355	-	0.8	363
	8	-	-	74.1	-	-	-	-	437	-	0.066	511
	9	-	-	-	-	-	-	-	-	-	0.066	0.066
	10	-	-	-	0.085	-	0.183	3.79	-	-	0.066	4.13
	11	-	-	-	-	-	-	-	-	-	-	-
	12	0.286	-	0.585	-	-	-	-	0.19	-	-	1.06
	13	-	-	-	-	-	-	-	-	-	-	-
4000												
Soils	15	-	-	7.8	-	-	-	-	209	-	-	216
	16	-	-	-	-	-	-	-	638	-	-	638
5000												
Metal debris	17	-	-	-	0.04	-	-	-	-	-	-	0.04
	18	-	-	-	2.17	-	-	-	-	-	-	2.17
	19	0.3	-	-	1.86	-	0.103	2.09	-	-	-	4.35
	20	-	8.08	5.85	-	-	0.0598	10.7	920	-	-	945
6000												
Lab packs	21	-	1.17	0.361	-	-	-	-	366	-	0.819	368
	22	-	1.2	0.361	-	-	-	-	183	-	-	185
	23	-	0.22	0.361	-	-	-	-	146	-	-	146
Other (see Table 3.12)	24-33	0.2	17.1	6.9	-	-	0.008	-	210	-	0.502	234
Total: Nonaqueous		0.792	28.1	187	5.2	-	0.556	16.7	3,460	-	11.3	3,710
Total: All		0.848	28.1	187	5.2	-	0.556	16.7	3,460	-	11.3	3,710

	Volume after Treatment (m^3/yr)										
Treated Waste for Disposal	LEHR	LBL	LLNL	Mare Is	GE[c]	Pearl H	Puget So	Hanford	SLAC[c]	SNL-CA[d]	Total[e] (Hanford)
Polymer grout	0.0955	0.124	21.4	0.0786	-	0.00724	0.195	51.9	-	-	73.8
Grout cement	0.102	2.11	54.2	2.05	-	0.293	5.14	1,190	-	-	1,260
Mercury solids	0.00019	0.00065	0.0254	0.00115	-	0.00011	0.00231	0.46	-	-	0.49

TABLE 3.6 (Cont.)

Waste Stream		Volume Generated (m^3/yr)						Volume Generated (m^3/yr)					Volume Generated (m^3/yr)		
MWIR-2 Category	WM PEIS Code	ANL-W	ETEC	GA	INEL	NTS	Total	ITRI	LANL	SNL-NM	Pantex	Total[f]	KCP	GJPO	Total[g]
1000															
Aqueous	1	-	-	2.518	13.1	-	15.6	-	4.19	-	-	4.19	-	0.0701	0.0701
	2	-	-	-	0.332	-	0.332	-	-	-	3.48	3.48	-	-	-
Total: Aqueous		-	-	2.518	13.4	-	15.9	-	4.19	-	3.48	7.67	-	0.0701	0.0701
2000															
Organic liquids	3	0.0004	0.0037	0.0386	0.2	-	0.242	-	-	0.0003	-	0.0003	-	0.0036	0.0036
	4	0.0004	0.0037	0.0386	0.186	-	0.229	0.107	7.34	0.0003	-	7.45	-	0.0036	0.0036
	5	0.0004	-	0.0001	0.834	-	0.835	-	-	-	1.44	1.44	-	0.0036	0.0036
	6	0.0004	-	0.0001	2.49	-	2.495	-	-	-	0.177	0.177	-	0.0036	0.0036
3000															
Solid process residues	7	0.385	0.45	0.273	32.3	-	33.4	-	-	-	2.61	2.61	-	0.002	0.002
	8	-	-	0.208	1.48	-	1.68	-	-	-	-	-	-	0.0015	0.0015
	9	-	-	0.0002	-	-	0.0002	-	3.49	-	-	3.49			
	10	-	-	0.0002	0.952	-	0.952	-	-	-	-	-	-	-	-
	11	-	-	-	0.863	-	0.863	-	-	-	-	-	-	-	-
	12	-	-	-	0.006	0.0178	0.0238	-	-	-	0.135	0.14	-	-	-
	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4000															
Soils	15	-	120	-	2.95	-	123	-	-	-	0.012	0.012	-	0.0277	0.0277
	16	-	-	-	-	-	-	-	-	-	-	-	-	0.0277	0.0277
5000															
Metal debris	17	-	-	0.063	10.6	-	10.7	-	6.94	0.002	8.5	15.4	0.034	-	0.034
	18	-	-	-	0.324	-	0.324	-	12.8	-	2.01	14.8	-	-	-
	19	0.232	0.12	-	2.7	-	3.05	-	-	2.35	43.1	45.4	0.047	-	0.047
	20	0.806	0.62	1.02	54	-	56.5	-	2.63	3.86	3.21	9.7	-	-	-
6000															
Lab packs	21	-	-	-	0.021	-	0.021	-	0.0054	0.0015	2.25	2.26	-	-	-
	22	-	-	-	0.059	-	0.059	-	0.328	0.0017	-	0.33	-	-	-
	23	-	-	-	0.585	-	0.585	-	0.0054	0.0015	-	0.0069	-	-	-
Other (see Table 3.12)	24-33	0.54	3.8	0.166	57.3	0.0401	61.9	3.38	0.7	0.352	2.11	6.3	-	0.0338	0.0338
Total: Nonaqueous		1.96	125	1.81	168	0.0579	297	3.5	34.1	6.56	65.5	110	0.081	0.107	0.188
Total: All		1.96	125	4.33	181	0.0579	313	3.5	38.3	6.56	69	117	0.081	0.177	0.258

Treated Waste for Disposal	Volume after Treatment (m^3/yr)						Volume after Treatment (m^3/yr)				Volume after Treatment (m^3/yr)		
	ANL-W	ETEC	GA	INEL	NTS[h]	Total[e] (INEL)	ITRI	LANL	SNL-NM	Pantex	KCP	GJPO	Total[i] (LANL)
Polymer grout	0.019	0.852	0.522	4.38	0.00497	5.78	0.00306	3.18	0.11	3.18	0.00163	0.0193	6.49
Grout cement	0.449	94.8	0.485	37.8	0.00861	134	0.0117	7.94	1.28	17.1	0.0192	0.0381	26.4
Mercury solids	0.00024	0.00265	0.00018	0.0119	<0.00001	0.0148	<0.0001	0.00042	0.0015	0.024	0.00002	0.00001	0.0258

TABLE 3.6 (Cont.)

Waste Stream		Volume Generated (m^3/yr)					Volume Generated (m^3/yr)		
MWIR-2 Category	WM PEIS Code	Charleston	Norfolk	Pinellas	SRS	Total	ORR	PGDP	Total[j]
1000									
Aqueous	1	-	-	-	-	-	84.2	0.18	84.4
	2	0.086	-	-	0.513	0.599	39	1.24	40.2
Total: Aqueous		0.086	-	-	0.513	0.599	123	1.42	125
2000									
Organic liquids	3	0.233	-	-	0.199	0.432	285	2.71	288
	4	0.304	-	-	0.199	0.502	300	2.71	303
	5	0.235	-	-	267	268	354	14.1	368
	6	0.232	-	-	266	266	278	14.1	292
3000									
Solid process residues	7	0.02	0.4	0.08	2.53	2.95	53.3	0.391	53.7
	8	-	-	-	231	231	2,040	2.19	2,040
	9	-	-	-	-	-	4.21	-	4.21
	10	-	-	0.02	0.0851	0.0851	4.21	-	4.21
	11	-	-	-	-	-	56.3	-	56.3
	12	-	-	-	-	-	10.3	-	10.3
	13	-	-	-	-	-	7.97	-	7.97
4000									
Soils	15	-	-	-	-	-	55.7	-	55.7
	16	-	-	-	-	-	599	-	599
5000									
Metal debris	17	-	-	-	40.7	40.7	0.38	0.167	0.547
	18	-	-	-	29	29	46.6	-	46.6
	19	0.08	0.2	-	30.8	31.1	227	-	227
	20	0.024	-	-	30.1	30.1	231	11.4	243
6000									
Lab packs	21	-	-	-	0.004	0.004	1.75	0.055	1.8
	22	-	-	-	0.004	0.004	1.21	0.049	1.26
	23	-	-	-	0.004	0.004	1.43	0.049	1.48
Other (see Table 3.12)	24-33	0.254	-	0.02	33.7	34	40	3.3	43
Total: Nonaqueous		1.38	0.6	0.12	932	934	4,950	53.8	5,004
Total: All		1.47	0.6	0.12	934	936	4,710	55.2	4,765

	Volume after Treatment (m^3/yr)					Volume after Treatment (m^3/yr)	
Treated Waste for Disposal	Charleston	Norfolk	Pinellas	SRS	Total[e] (SRS)	ORR	PGDP
Polymer grout	0.333	0.0114	-	246	246	528	14.2
Grout cement	0.166	0.304	-	199	199	1,510	7.46
Mercury solids	0.00014	0.00017	-	0.159	0.16	1.02	0.00578

TABLE 3.6 (Cont.)

Waste Stream		Volume Generated (m^3/yr)																	
MWIR-2 Category	WM PEIS Code	ANL-E	Ames	BCL	BNL	Bettis	Colonie	Fermi[c]	FEMP	KAPL-S	KAPL-K	KAPL-W	Mound	Ports Nav	PORTS	PPPL	RMI	Site A[c]	Total[k]
1000																			
Aqueous	1	0.262	0.0152	-	-	-	-	-	74	-	-	-	-	-	77.3	-	0.04	-	152
	2	-	0.001	-	-	-	0.086	-	0.632	-	-	-	-	-	22.8	-	0.55	-	24.1
Total: Aqueous		0.262	0.0162	-	-	-	0.086	-	74.6	-	-	-	-	-	100	-	0.59	-	176
2000																			
Organic liquids	3	-	-	-	0.49	-	0.233	-	0.161	0.172	0.132	0.018	-	-	7.85	-	-	-	9.06
	4	-	-	-	0.49	-	0.305	-	2.9	0.172	0.132	0.018	-	-	42.5	-	-	-	46.5
	5	-	-	-	0.37	0.0002	0.235	-	9.43	0.172	0.132	0.018	-	-	-	-	0.68	-	11
	6	-	-	-	0.37	0.0752	0.232	-	10.4	0.172	0.132	0.018	-	-	0.01	-	0.06	-	11.5
3000																			
Solid process residues	7	1.53	-	-	0.0401	0.0223	-	-	40.7	0.062	0.04	0.01	-	0.08	54.7	-	0.17	-	97.3
	8	191	-	-	15.4	0.0026	-	-	51.9	0.032	0.04	0.01	-	-	133	-	-	-	391
	9	-	-	-	-	0.0013	-	-	15.7	0.032	0.04	0.01	-	-	-	-	0.34	-	16.1
	10	-	-	-	0.602	-	-	-	10.9	0.032	0.04	0.01	-	0.021	-	-	-	-	11.6
	11	-	-	-	-	0.714	-	-	-	0.04	0.42	0.1	-	-	52.9	-	-	-	54.2
	12	-	-	-	-	-	-	-	30.1	0.04	0.42	0.1	-	-	11.3	-	-	-	41.9
	13	-	-	-	-	-	-	-	-	0.04	0.42	0.1	-	-	-	-	-	-	0.56
4000																			
Soils	15	610	-	-	-	0.239	-	-	0.54	2.24	2.66	0.42	-	-	0.791	-	-	-	617
	16	-	-	-	-	-	-	-	0.18	2.24	2.66	0.42	-	-	0.791	-	-	-	6.29
5000																			
Metal debris	17	16.2	-	-	-	-	-	-	0.882	-	0.042	-	-	-	5.07	-	-	-	22.2
	18	0.286	-	-	-	-	-	-	4.89	0.02	-	-	-	-	-	-	0.04	-	5.24
	19	4.16	-	-	-	0.25	-	-	2.19	1.21	0.16	0.525	-	-	34.8	-	1.03	-	44.3
	20	0.042	-	-	-	0.021	-	-	6.61	0.221	1.82	1.16	-	-	2,280	-	-	-	2,290
6000																			
Lab packs	21	0.679	-	0.0044	-	-	-	-	0.04	0.256	0.21	0.017	-	-	-	0.0016	-	-	1.21
	22	3.49	-	-	-	-	-	-	-	0.256	0.21	0.017	-	-	-	-	-	-	3.97
	23	-	0.025	-	0.817	-	-	-	-	0.256	0.21	0.017	-	-	8.35	-	-	-	9.68
Other (see Table 3.12)	24-33	12.3	0.015	0.0141	0.488	1.54	-	-	0.75	0.666	0.61	1.017	0.0022	0.02	30.5	-	-	-	47.9
Total: Nonaqueous		839	0.04	0.0185	19.1	2.86	1.0	-	188	8.33	10.5	4.0	0.0022	0.121	2,660	0.0016	2.32	NA	3,730
Total: All		840	0.0562	0.0185	-	2.86	1.09	-	263	8.33	10.5	4.0	0.0022	0.121	2,760	0.0016	2.91	NA	3,910

	Volume after Treatment (m^3/yr) — Cont.																	
Treated Waste for Disposal	ANL-E	Ames	BCL	BNL	Bettis	Colonie	Fermi[c]	FEMP	KAPL-S	KAPL-K	KAPL-W	Mound	Ports Nav	PORTS	PPPL	RMI	Site A[c]	Total[l] (ORR)
Polymer grout	6.91	0.0046	0.0002	0.81	0.244	0.33	-	42.2	0.399	0.513	0.118	-	0.0009	46.6	0.0001	0.898	-	641
Grout cement	570	0.0057	0.001	7.6	0.311	0.129	-	65.4	3.45	3.99	0.909	-	0.0656	532	0.0004	0.595	-	2,700
Mercury solids	0.0693	<0.0001	<0.0001	0.00478	0.0003	0.0001	-	0.0303	0.0014	0.0012	0.0005	-	-	0.25	-	0.001	-	0.33

See next page for footnotes.

TABLE 3.6 (Cont.)

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[a] The data presented in this table are the same for Cases 7 and 10a, except for the routing of treated wastes for disposal. For Case 10a, all wastes would be disposed of at NTS, as follows: polymer grout, 973 m^3/yr; grout cement, 4,319 m^3/yr; and mercury solids, 2.07 m^3/yr.

[b] A hyphen indicates that the site reports no waste in MWIR-2.

[c] Site not currently listed on MWIR-2.

[d] SNL-CA treated waste volumes are included in LLNL waste volumes.

[e] The site listed in parentheses would be both the treatment and disposal site for these wastes.

[f] These wastes would be treated at LANL.

[g] These wastes would be treated at RFETS (RFETS has no on-site non-alpha waste).

[h] For Case 7, NTS would receive only treated aqueous residues for disposal.

[i] The wastes that were treated at LANL and RFETS would be disposed of at LANL.

[j] These wastes would be treated at ORR.

[k] These wastes would be treated at PORTS.

[l] The wastes that were treated at ORR and PORTS would be disposed of at ORR and are included in this total.

TABLE 3.7 Volumes of CH Alpha LLMW from MWIR-2 for Cases 7 and 10a[a,b]

Waste Stream		Volume Generated (m^3/yr)						Volume Generated (m^3/yr)			Volume Generated at RFETS (m^3/yr)
MWIR-2 Category	WM PEIS Code	ANL-W	INEL	LBL	LLNL	SNL-CA[c]	Total	ITRI	LANL	Total	
1000											
Aqueous	1	-	-	-	-	-	-	-	1.81	1.81	4,750
	2	-	0.59	-	-	-	0.59	-	-	-	21.3
Total: Aqueous		-	0.59	-	-	-	0.59	-	1.81	1.81	4,770
2000											
Organic liquids	3	-	-	-	25.1	-	25.1	-	40.5	40.5	2.16
	4	-	-	-	25.1	-	25.1	-	27.5	27.5	2.16
	5	-	-	-	6.55	-	6.55	-	-	-	3.65
	6	-	-	-	6.55	-	6.55	-	-	-	3.65
3000											
Solid process residues	7	-	106	-	-	-	106	-	-	-	18
	8	-	34.2	-	7.8	-	42	-	-	-	0.432
	9	-	1.36	-	-	-	1.36	-	-	-	0.021
	10	-	208	-	58.5	-	267	-	0.32	0.32	1,810
	11	-	-	-	-	-	-	-	-	-	0.063
4000											
Soils	15	-	-	-	0.39	-	0.39	-	-	-	-
	16	-	21.4	-	-	-	21.4	-	-	-	119
5000											
Metal debris	17	-	838	-	11.7	-	850	-	114	114	23.8
	18	-	36.2	-	-	-	36.2	-	-	-	3.51
	19	-	76.4	-	0.78	-	77.1	-	-	-	1.41
	20	-	789	-	48.8	-	838	-	13.5	13.5	163
6000											
Lab packs	21	-	-	-	-	-	-	-	0.332	0.332	3.71
	22	-	-	-	-	-	-	-	8.82	8.82	3.71
	23	-	-	-	-	-	-	-	0.332	0.332	3.71
Other (see Table 3.12)	24-33	-	351	0.44	5.85	-	357	0.145	5.84	5.98	10.9
Total: Nonaqueous		-	2,460	0.44	197	-	2,660	0.145	211	211	2,180
Total: All		-	2,460	0.44	197	-	2,660	0.145	213	213	6,940

Treated Waste for Disposal	INEL[d] Volume after Treatment (m^3/yr)	LANL[d] Volume after Treatment (m^3/yr)	RFETS[d] Volume after Treatment (m^3/yr)
Polymer grout	30.5	19.4	933
Grout cement	663	36.8	1,410
Mercury solids	0.171	0.00296	0.266

TABLE 3.7 (Cont.)

Waste Stream		Volume Generated at Hanford[e] (m^3/yr)	Volume Generated (m^3/yr)					
MWIR-2 Category	WM PEIS Code		Bettis	Mound	UofMO	SRS	WVDP	Total
1000								
Aqueous	1	-	-	-	-	-	0.076	0.076
	2	-	-	-	-	-	0.0497	0.0497
Total: Aqueous		-	-	-	-	-	0.126	0.126
2000								
Organic liquids	3	-	-	-	-	3.53	0.908	4.44
	4	-	-	-	-	3.53	0.944	4.47
	5	-	-	1.01	-	-	0.0711	1.08
	6	-	-	1.01	-	-	0.0159	1.02
3000								
Solid process residues	7	-	-	-	-	52.7	1.58	54.3
	8	-	-	-	-	-	-	-
	9	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-
4000								
Soils	15	-	-	-	-	0.603	-	0.603
	16	-	-	-	-	0.603	-	0.603
5000								
Metal debris	17	-	-	-	-	-	-	-
	18	-	-	-	-	-	0.0033	0.0033
	19	-	1.09	0.002	-	-	-	1.09
	20	-	-	-	0.145	344	0.0089	344
6000								
Lab packs	21	-	-	0.0021	-	-	0.0038	0.0059
	22	-	-	0.0021	-	-	0.0888	0.0909
	23	-	-	0.0081	-	-	-	0.0081
Other (see Table 3.12)	24-33	-	-	4.92	-	-	0.269	5.18
Total: Nonaqueous		-	1.09	6.94	0.145	405	3.89	417
Total: All		-	1.09	6.94	0.145	405	4.02	417

Treated Waste for Disposal	Hanford[e] Volume after Treatment (m^3/yr)	SRS[d] Volume after Treatment (m^3/yr)
Polymer grout	-	6.38
Grout cement	-	99.1
Mercury solids	-	0.0352

See next page for footnotes.

TABLE 3.7 (Cont.)

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[a] The data presented in this table are the same for Cases 7 and 10a, except for the routing of treated wastes for disposal. For Case 10a, all wastes would be disposed of at NTS, as follows: polymer grout, 989 m^3/yr; grout cement, 2,210 m^3/yr; and mercury solids, 0.475 m^3/yr.

[b] A hyphen indicates that the site reports no waste in MWIR-2.

[c] The SNL-CA waste volumes are included in the LLNL waste volumes.

[d] This site would be both the treatment and disposal site for these wastes.

[e] Hanford reports no alpha waste in MWIR-2.

TABLE 3.8 Volumes of CH Non-Alpha LLMW from MWIR-2 for Case 15[a,b]

Waste Stream		Volume Generated (m^3/yr)										
MWIR-2 Category	WM PEIS Code	ANL-W	ETEC	GA	GJPO	INEL	ITRI	LANL	NTS	Pantex	SNL-NM	Total
1000												
Aqueous	1	-	-	2.52	0.0701	13.1	-	4.19	-	-	-	19.9
	2	-	-	-	-	0.332	-	-	-	3.48	-	3.81
Total: Aqueous		-	-	2.52	0.0701	13.4	-	4.19	-	3.48	-	23.7
2000												
Organic liquids	3	0.0004	0.0037	0.0386	0.0036	0.2	-	-	-	-	0.0003	0.246
	4	0.0004	0.0037	0.0386	0.0036	0.186	0.107	7.34	-	-	0.0003	7.68
	5	0.0004	-	0.0001	0.0036	0.834	-	-	-	1.44	-	2.28
	6	0.0004	-	0.0001	0.0036	2.49	-	-	-	0.177	-	2.68
3000												
Solid process residues	7	0.385	0.45	0.272	0.002	32.3	-	-	-	2.61	-	36
	8	-	-	0.208	0.0015	1.48	-	-	-	-	-	1.69
	9	-	-	0.0002	-	-	-	3.49	-	-	-	3.49
	10	-	-	0.0002	-	0.952	-	-	-	-	-	0.952
	11	-	-	-	-	0.863	-	-	-	-	-	0.863
	12	-	-	-	-	0.006	-	-	0.0178	0.135	-	0.159
	13	-	-	-	-	-	-	-	-	-	-	-
4000												
Soils	15	-	120	-	0.0277	2.95	-	-	-	0.012	-	123
	16	-	-	-	0.0277	-	-	-	-	-	-	0.0277
5000												
Metal debris	17	-	-	0.063	-	10.6	-	6.94	-	8.5	0.002	26.1
	18	-	-	-	-	0.324	-	12.8	-	2.01	-	15.2
	19	0.232	0.12	-	-	2.7	-	-	-	43.1	2.35	48.5
	20	0.806	0.62	1.02	-	54	-	2.63	-	3.21	3.86	66.2
6000												
Lab packs	21	-	-	-	-	0.021	-	0.0054	-	2.25	0.0015	2.28
	22	-	-	-	-	0.059	-	0.328	-	-	0.0017	0.389
	23	-	-	-	-	0.585	-	0.0054	-	-	0.0015	0.592
Other (see Table 3.12)	24-33	0.54	3.8	0.166	0.0338	57.3	3.38	0.5	0.0401	2.11	0.352	68.2
Total: Nonaqueous		1.96	125	1.81	0.107	168	3.49	34.1	0.0579	65.5	6.56	407
Total: All		1.96	125	4.33	0.177	181	3.49	38.3	0.0579	69	6.56	430

	Volume after Treatment (m^3/yr)										
Treated Waste for Disposal	ANL-W	ETEC	GA	GJPO	INEL	ITRI	LANL	NTS	Pantex	SNL-NM	Total[c] (INEL)
Polymer grout	0.019	0.8523	0.522	0.0193	4.38	0.00306	3.18	0.00497	3.18	0.11	12.3
Grout cement	0.4486	94.77	0.485	0.038	37.8	0.0117	7.94	0.00861	17.1	1.28	160
Mercury solids	0.00024	0.00265	0.00018	0.00001	0.0119	<0.00001	0.00042	<0.00001	0.024	0.0015	0.0406

TABLE 3.8 (Cont.)

Waste Stream		Volume Generated (m^3/yr)										
MWIR-2 Category	WM PEIS Code	LEHR	LBL	LLNL	Mare Is	GE[d]	Pearl H	Puget So	Hanford	SLAC[d]	SNL-CA	Total
1000												
Aqueous	1	-	-	-	-	-	-	-	-	-	-	-
	2	0.056	-	-	-	-	-	-	-	-	-	0.056
Total: Aqueous		0.056	-	-	-	-	-	-	-	-	-	0.056
2000												
Organic liquids	3	0.0014	-	42.2	-	-	0.002	-	-	-	-	42.3
	4	0.0014	-	42.2	-	-	-	-	-	-	-	42.3
	5	0.0014	-	-	-	-	-	0.044	-	-	-	0.0454
	6	0.0014	0.38	-	-	-	-	-	-	-	9.02	9.4
3000												
Solid process residues	7	-	-	5.85	1.0507	-	0.2	-	355	-	0.8	363
	8	-	-	74.1	-	-	-	-	437	-	0.066	511
	9	-	-	-	-	-	-	-	-	-	0.066	0.066
	10	-	-	-	0.085	-	0.183	3.79	-	-	0.066	4.13
	11	-	-	-	-	-	-	-	-	-	-	-
	12	0.286	-	0.585	-	-	-	-	0.19	-	-	1.06
	13	-	-	-	-	-	-	-	-	-	-	-
4000												
Soils	15	-	-	7.8	-	-	-	-	209	-	-	216
	16	-	-	-	-	-	-	-	638	-	-	638
5000												
Metal debris	17	-	-	-	0.04	-	-	-	-	-	-	0.04
	18	-	-	-	2.169	-	-	-	-	-	-	2.17
	19	0.3	-	-	1.858	-	0.103	2.09	-	-	-	4.35
	20	-	8.08	5.85	-	-	0.0598	10.7	920	-	-	945
6000												
Lab packs	21	-	1.17	0.361	-	-	-	-	366	-	0.819	368
	22	-	1.2	0.361	-	-	-	-	183	-	-	185
	23	-	0.22	0.361	-	-	-	-	146	-	-	146
Other (see Table 3.12)	24-33	0.2	17.1	6.9	-	-	0.008	-	210	-	0.502	234
Total: Nonaqueous		0.792	28.1	187	5.2	-	0.556	16.7	3,460	-	11.3	3,714
Total: All		0.85	28.1	187	5.2	-	0.556	16.7	3,460	-	11.3	3,710

	Volume after Treatment (m^3/yr)										
Treated Waste for Disposal	LEHR	LBL	LLNL	Mare Is	GE[d]	Pearl H	Puget So	Hanford	SLAC[d]	SNL-CA[e]	Total[c] (Hanford)
Polymer grout	0.0955	0.124	21.4	0.0786	-	0.00724	0.195	51.9	-	-	73.8
Grout cement	0.102	2.11	54.2	2.05	-	0.293	5.14	1,190	-	-	1,260
Mercury solids	0.00019	0.00065	0.0254	0.00115	-	0.00011	0.00231	0.46	-	-	0.49

TABLE 3.8 (Cont.)

Waste Stream		Volume Generated (m^3/yr)												
MWIR-2 Category	WM PEIS Code	ANL-E	Ames	BCL	BNL	Bettis	Colonie	Fermi[d]	FEMP	KAPL-S	KCP	KAPL-K	KAPL-W	Mound
1000														
Aqueous	1	0.262	0.0152	-	-	-	-	-	74	-	-	-	-	-
	2	-	0.001	-	-	-	0.086	-	0.632	-	-	-	-	-
Total: Aqueous		0.262	0.0162	-	-	-	0.086	-	74.6	-	-	-	-	-
2000														
Organic liquids	3	-	-	-	0.49	-	0.2332	-	0.161	0.172	-	0.132	0.018	-
	4	-	-	-	0.49	-	0.3039	-	2.9	0.172	-	0.132	0.018	-
	5	-	-	-	0.37	0.0002	0.2352	-	9.43	0.172	-	0.132	0.018	-
	6	-	-	-	0.37	0.0752	0.2325	-	10.4	0.172	-	0.132	0.018	-
3000														
Solid process residues	7	1.53	-	-	0.0401	0.0223	-	-	40.7	0.062	-	0.04	0.01	-
	8	191	-	-	15.4	0.0026	-	-	51.9	0.032	-	0.04	0.01	-
	9	-	-	-	-	0.0013	-	-	15.7	0.032	-	0.04	0.01	-
	10	-	-	-	0.602	-	-	-	10.9	0.032	-	0.04	0.01	-
	11	-	-	-	-	0.714	-	-	-	0.04	-	0.42	0.1	-
	12	-	-	-	-	-	-	-	30.1	0.04	-	0.42	0.1	-
	13	-	-	-	-	-	-	-	-	0.04	-	0.42	0.1	-
4000														
Soils	15	610	-	-	-	0.239	-	-	0.54	2.24	-	2.66	0.42	-
	16	-	-	-	-	-	-	-	0.18	2.24	-	2.66	0.42	-
5000														
Metal debris	17	16.2	-	-	-	-	-	-	0.882	-	0.034	0.042	0.42	-
	18	0.286	-	-	-	-	-	-	4.89	0.02	-	-	-	-
	19	4.16	-	-	-	0.25	-	-	2.19	1.21	0.047	0.16	0.525	-
	20	0.042	-	-	-	0.021	-	-	6.61	0.221	-	1.82	1.16	-
6000														
Lab packs	21	0.679	-	0.0044	-	-	-	-	0.04	0.256	-	0.21	0.017	-
	22	3.49	-	-	-	-	-	-	-	0.256	-	0.21	0.017	-
	23	-	0.025	-	0.817	-	-	-	-	0.256	-	0.21	0.017	-
Other (see Table 3.12)	24-33	12.3	0.015	0.0141	0.488	1.54	-	-	0.75	0.666	-	0.61	1.02	0.0022
Total: Nonaqueous		839	0.04	0.0185	19.1	2.86	1	-	188	8.33	0.081	10.5	4	0.0022
Total: All		840	0.0562	0.0185	19.1	2.86	1.09	-	263	8.33	0.081	10.5	4	0.0022

Treated Waste for Disposal	Volume after Treatment (m^3/yr)												
	ANL-E	Ames	BCL	BNL	Bettis	Colonie	Fermi[d]	FEMP	KAPL-S	KCP	KAPL-K	KAPL-W	Mound
Polymer grout	6.91	0.00457	0.00016	0.81	0.244	0.33	-	42.2	0.399	0.00163	0.513	0.118	-
Grout cement	570	0.00574	0.001	7.6	0.311	0.129	-	65.4	3.45	0.0192	3.99	0.909	-
Mercury solids	0.0693	0.00001	<0.00001	0.00478	0.0003	0.00009	-	0.03	0.00145	0.00002	0.00124	0.00053	-

TABLE 3.8 (Cont.)

Waste Stream		Volume Generated (m^3/yr) — Cont.								Volume Generated (m^3/yr)				
MWIR-2 Category	WM PEIS Code	ORR	PGDP	Ports Nav	PORTS	PPPL	RMI	Site A[d]	Total[f]	Charleston	Norfolk	Pinellas	SRS	Total
1000														
Aqueous	1	84.2	0.18	-	77.3	-	0.04	-	236	-	-	-	-	-
	2	39	1.24	-	22.8	-	0.55	-	64.3	0.086	-	-	0.513	0.599
Total: Aqueous		123	1.42	-	100	-	0.59	-	300	0.086	-	-	0.513	0.599
2000														
Organic liquids	3	285	2.71	-	7.85	-	-	-	297	0.233	-	-	0.199	0.432
	4	300	2.71	-	42.5	-	-	-	349	0.304	-	-	0.199	0.502
	5	354	14.1	-	-	-	0.68	-	379	0.235	-	-	267	268
	6	278	14.1	-	0.01	-	0.06	-	304	0.232	-	-	266	266
3000														
Solid process residues	7	53.3	0.391	0.08	54.7	-	0.17	-	151	0.02	0.4	0.08	2.53	2.95
	8	2040	2.19	-	133	-	-	-	2,430	-	-	-	231	231
	9	4.21	-	-	-	-	0.34	-	20.3	-	-	-	-	-
	10	4.21	-	0.021	-	-	-	-	15.8	-	-	0.02	0.0851	0.0851
	11	56.3	-	-	52.9	-	-	-	110	-	-	-	-	-
	12	10.3	-	-	11.3	-	-	-	52.3	-	-	-	-	-
	13	7.97	-	-	-	-	-	-	8.53	-	-	-	-	-
4000														
Soils	15	55.7	-	-	0.791	-	-	-	672	-	-	-	-	-
	16	599	-	-	0.791	-	-	-	605	-	-	-	-	-
5000														
Metal debris	17	0.38	0.167	-	5.07	-	-	-	22.8	-	-	-	40.7	40.7
	18	46.6	-	-	-	-	0.04	-	51.8	-	-	-	29	29
	19	227	-	-	34.8	-	1.03	-	272	0.08	0.2	-	30.8	31.1
	20	231	11.4	-	2,280	-	-	-	2,530	0.024	-	-	30	30.1
6000														
Lab packs	21	1.75	0.055	-	-	0.0016	-	-	3.01	-	-	-	0.004	0.004
	22	1.21	0.049	-	-	-	-	-	5.23	-	-	-	0.004	0.004
	23	1.43	0.049	-	8.35	-	-	-	11.2	-	-	-	0.004	0.004
Other (see Table 3.12)	24-33	40	3.3	0.02	30.5	-	-	-	1,670	0.254	-	0.02	33.7	34
Total: Nonaqueous		4,950	53.8	0.121	2,660	0.0016	2.32	-	8,380	1.38	0.6	0.12	932	934
Total: All		4,710	55.2	0.121	2,760	0.0016	2.91	-	8,720	1.47	0.6	0.12	933	936

	Volume after Treatment (m^3/yr) — Cont.								Volume after Treatment (m^3/yr)				
Treated Waste for Disposal	ORR	PGDP	Ports Nav	PORTS	PPPL	RMI	Site A[d]	Total[c,f] (ORR)	Charleston	Norfolk	Pinellas	SRS	Total[c] (SRS)
Polymer grout	528	14.2	0.00092	46.6	0.00006	0.898	-	641	0.333	0.0114	NA	246	246
Grout cement	1,510	7.46	0.0656	532	0.00035	0.595	-	2,700	0.166	0.304	NA	199	199
Mercury solids	1.02	0.00578	0.00002	0.25	<0.00001	0.00082	-	1.38	0.00014	0.00017	NA	0.159	0.16

See next page for footnotes.

TABLE 3.8 (Cont.)

[a] Two sites, NTS and LANL, would receive only treated aqueous residue for disposal. The annual volumes for NTS would be grout cement, 0.007 m^3/yr; polymer grout, 0.48 m^3/yr; and mercury solids, 0.00001 m^3/yr. The annual volumes for LANL would be grout cement, 0.3 m^3/yr; polymer grout, 1.10 m^3/yr; and mercury solids, 0.0004 m^3/yr.

[b] A hyphen indicates that the site reports no waste in MWIR-2.

[c] These wastes would be treated and disposed of at the site listed in parentheses.

[d] Site not currently listed on MWIR-2.

[e] SNL-CA treated waste volumes are included in the LLNL waste volumes.

[f] Total volumes listed include wastes from ANL-E, Ames, BCL, BNL, Bettis, Colonie, FEMP, KAPL-S, KCP, KAPL-K, KAPL-W, ORR, PGDP, Ports Nav, PORTS, PPPL, RMI, Site A, and WVDP.

TABLE 3.9 Volumes of CH Alpha LLMW from MWIR-2 for Case 15[a]

Waste Stream		Waste Generated (m^3/yr)								
MWIR-2 Category	WM PEIS Code	ANL-W	INEL	ITRI	LANL[b]	LBL	LLNL	RFETS	SNL-CA	Total
1000										
Aqueous	1	-	-	-	1.81	-	-	4,750	-	4,750
	2	-	0.59	-	-	-	-	21.3	-	21.9
Total: Aqueous		-	0.59	-	1.81	-	-	4,770	-	4,770
2000										
Organic liquids	3	-	-	-	40.5	-	25.1	2.16	-	67.8
	4	-	-	-	27.5	-	25.1	2.16	-	54.7
	5	-	-	-	-	-	6.55	3.65	-	10.2
	6	-	-	-	-	-	6.55	3.65	-	10.2
3000										
Solid process residues	7	-	106	-	-	-	-	18	-	124
	8	-	34.2	-	-	-	7.8	0.432	-	42.5
	9	-	1.36	-	-	-	-	0.021	-	1.38
	10	-	208	-	0.32	-	58.5	1,810	-	2,080
	11	-	-	-	-	-	-	0.063	-	0.063
4000										
Soils	15	-	-	-	-	-	0.39	-	-	0.39
	16	-	21.4	-	-	-	-	119	-	141
5000										
Metal debris	17	-	838	-	114	-	11.7	23.8	-	987
	18	-	36.2	-	-	-	-	3.51	-	39.7
	19	-	76.4	-	-	-	0.78	1.41	-	78.6
	20	-	789	-	13.5	-	48.8	163	-	1,010
6000										
Lab packs	21	-	-	-	0.332	-	-	3.71	-	4.05
	22	-	-	-	8.82	-	-	3.71	-	12.5
	23	-	-	-	0.332	-	-	3.71	-	4.05
Other (see Table 3.12)	24-33	-	351	0.145	5.84	0.44	5.85	10.9	-	374
Total: Nonaqueous		-	2,460	0.145	211	0.44	197	2,180	-	5,050
Total: All		-	2,460	0.145	213	0.44	197	6,940	-	9,810

Treated Waste for Disposal	INEL[c] Volume after Treatment (m^3/yr)
Polymer grout	983
Grout cement	2,110
Mercury solids	0.44

TABLE 3.9 (Cont.)

Waste Stream		Waste Generated (m^3/yr)							Total All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code	Hanford[d]	Bettis	Mound	UofMO	SRS	WVDP	Total	
1000									
Aqueous	1	-	-	-	-	-	0.076	0.076	4,750
	2	-	-	-	-	-	0.0497	0.0497	21.9
Total: Aqueous		-	-	-	-	-	0.126	0.126	4,770
2000									
Organic liquids	3	-	-	-	-	3.53	0.908	4.43	72.2
	4	-	-	-	-	3.53	0.944	4.47	59.2
	5	-	-	1.01	-	-	0.0711	1.08	11.3
	6	-	-	1.01	-	-	0.0159	1.02	11.2
3000									
Solid process residues	7	-	-	-	-	52.7	1.58	54.3	179
	8	-	-	-	-	-	-	-	42.5
	9	-	-	-	-	-	-	-	1.38
	10	-	-	-	-	-	-	-	2,080
	11	-	-	-	-	-	-	-	0.063
4000									
Soils	15	-	-	-	-	0.603	-	0.603	0.993
	16	-	-	-	-	0.603	-	0.603	141
5000									
Metal debris	17	-	-	-	-	-	-	-	987
	18	-	-	-	-	-	0.0033	0.0033	39.7
	19	-	1.09	0.002	-	-	-	1.09	79.7
	20	-	-	-	0.145	344	0.0089	344	1,360
6000									
Lab packs	21	-	-	0.0021	-	-	0.0038	0.0059	4.05
	22	-	-	0.0021	-	-	0.0888	0.0909	12.6
	23	-	-	0.0081	-	-	-	0.0081	4.05
Other (see Table 3.12)	24-33	-	-	4.92	-	-	0.269	5.18	379
Total: Nonaqueous		-	1.09	6.94	0.145	405	3.89	417	5,460
Total: All		-	1.09	6.94	0.145	405	4.02	417	10,200

Treated Waste for Disposal	Hanford[d] Volume after Treatment (m^3/yr)	SRS[c] Volume after Treatment (m^3/yr)	All Sites (m^3/yr)
Polymer grout	-	6.38	989
Grout cement	-	99.1	2,210
Mercury solids	-	0.0352	0.475

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] LANL would dispose of treated aqueous residues, as follows: grout cement, 5.85 m^3/yr; polymer grout, 920 m^3/yr; and mercury solids, 0.009 m^3/yr.

[c] Hanford reports no alpha waste in MWIR-2.

[d] This site would be both the treatment and disposal site for these wastes.

TABLE 3.10 Volumes of CH Non-Alpha LLMW from MWIR-2 for Case 17

Waste Stream		Total Volume All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code	
1000		
Aqueous	1	256
	2	68.8
Total: Aqueous		325
2000		
Organic liquids	3	340
	4	400
	5	649
	6	582
3000		
Solid process residues	7	553
	8	3,170
	9	23.9
	10	21
	11	111
	12	53.5
	13	8.53
4000		
Soils	15	1,010
	16	1,240
5000		
Metal debris	17	89.6
	18	98.1
	19	356
	20	3,570
6000		
Lab packs	21	374
	22	191
	23	158
Other (see Table 3.12)	24-33	427
Total: Nonaqueous		13,437
Total: All		13,737

Treated Waste for Disposal at Hanford	Volume after Treatment (m^3/yr)
Polymer grout	973
Grout cement	4,320
Mercury solids	2.07

TABLE 3.11 Volumes of RH Non-Alpha LLMW from MWIR-2 for Case 26[a]

Waste Stream		Volume Generated (m^3/yr)			Volume Generated (m^3/yr)			Volume Generated at Hanford[c] (m^3/yr)	Volume Generated at SRS[c] (m^3/yr)	Total Volume All Sites (m^3/yr)	RH alpha at INEL[d] (m^3/yr)
MWIR-2 Category	WM PEIS Code	ANL-W[b]	INEL[c]	Total	Bettis[b]	ORR[c]	Total				
1000											
Aqueous	1	-	-	-	-	348	348	-	-	348	-
Total: Aqueous		-	-	-	-	348	348	-	-	348	-
3000											
Solid process residues	7	-	-	-	0.0001	-	0.0001	0.017	0.204	0.221	-
	8	-	-	-	-	-	-	-	0.204	0.204	-
	9	0.209	-	0.209	-	-	-	-	0.204	0.413	-
	10	-	-	-	-	-	-	-	0.204	0.204	0.042
5000											
Metal debris	17	-	-	-	-	-	-	-	0.344	0.344	0.0084
	20	0.04	807	807	-	-	-	-	1.63	809	0.0084
Other (see Table 3.12)	24-33	0.899	55.9	56.8	-	-	-	0.0571	-	56.9	0.0084
Total: Nonaqueous		1.15	863	864	0.0001	-	0.0001	0.0741	2.79	867	0.602
Total		1.15	863	864	0.0001	348	348	0.0741	2.79	1,220	0.67

Treated Waste for Disposal	Volume after Treatment (m^3/yr)				Total All Sites (m^3/yr)	INEL Volume[d] (m^3/yr)
	INEL[e]	ORR[e]	Hanford[e]	SRS[e]		
Polymer grout	6.26	67.7	0.00019	0.141	74.1	0.00491
Grout cement	146	1.81	0.0108	0.734	149	0.146
Mercury solids	0.0586	0.00049	<0.00001	0.00023	0.0592	0.00005

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] Generation site only.

[c] Generation site and treatment site.

[d] RH alpha — treatment and disposal only; INEL is the only site with both RH alpha and RH non-alpha waste.

[e] This site would be both the treatment site and disposal site for these wastes.

TABLE 3.12 Volumes of Other CH Non-Alpha LLMW from MWIR-2 for Case 2a[a]

Waste Stream		Volume Generated (m^3/yr)						
MWIR-2 Category	WM PEIS Code	ANL-E	Ames	ANL-W	BCL	BNL	Bettis	Charleston
6200 Reactive metals	24	0.10	-	0.54	-	-	-	-
6300 Explosive propellants	25	-	-	-	-	-	-	-
6400 Compressed gases	26	-	-	-	-	-	-	-
7100 Elemental mercury	27	-	-	-	-	0.044	-	-
7200 Elemental lead	28	8.93	0.015	-	0.0141	0.444	1.537	0.254
7300 Beryllium	29	-	-	-	-	-	-	-
7400 Batteries	30	-	-	-	-	-	-	-
8000 Unknown	31	-	-	-	-	-	-	-
9000 Final forms	32[b]	-	-	-	-	-	-	-
6140 Scintillation cocktails	33[c]	-	-	-	-	-	0.0012	-
Total		9.03	0.015	0.54	0.0141	0.488	1.5382	0.254

Waste Stream		Volume Generated (m^3/yr)						
MWIR-2 Category	WM PEIS Code	LEHR	ETEC	FEMP	GA	GJPO	INEL	ITRI
6200 Reactive metals	24	-	-	0.06	0.0416	-	0.025	-
6300 Explosive propellants	25	-	-	-	-	-	-	-
6400 Compressed gases	26	-	-	-	-	-	-	-
7100 Elemental mercury	27	-	-	0.0626	-	-	-	-
7200 Elemental lead	28	0.2	3.8	0.13	0.125	-	53.8	0.12
7300 Beryllium	29	-	-	-	-	-	-	-
7400 Batteries	30	-	-	0.498	-	-	-	-
8000 Unknown	31	-	-	-	-	-	2.6	-
9000 Final forms	32[b]	-	-	-	-	-	0.84	-
6140 Scintillation cocktails	33[c]	-	-	-	-	0.0338	0.021	3.26
Total		0.2	3.8	0.75	0.1664	0.0338	57.3	3.38

Waste Stream		Volume Generated (m^3/yr)						
MWIR-2 Category	WM PEIS Code	KAPL-S	KAPL-K	KAPL-W	LANL	LBL	LLNL	Mound
6200 Reactive metals	24	-	-	-	-	-	-	-
6300 Explosive propellants	25	-	-	-	-	-	-	-
6400 Compressed gases	26	-	-	-	-	-	-	-
7100 Elemental mercury	27	-	-	-	0.128	0.014	0.01	0.0022
7200 Elemental lead	28	0.41	0.4	1	0.128	0.104	6.52	-
7300 Beryllium	29	-	-	-	0.128	-	-	-
7400 Batteries	30	-	-	-	0.128	-	-	-
8000 Unknown	31	-	-	-	-	-	-	-
9000 Final forms	32[b]	-	-	-	27	-	-	-
6140 Scintillation cocktails	33[c]	0.256	0.21	0.017	0.0054	17	0.361	-
Total		0.666	0.61	1.02	0.5	17.1	6.9	0.0022

TABLE 3.12 (Cont.)

Waste Stream		Volume Generated (m^3/yr)						
MWIR-2 Category	WM PEIS Code	NTS	ORR	PGDP	Pearl H	Ports Nav	PORTS	Pantex
6200 Reactive metals	24	-	4.8	-	-	-	0.26	-
6300 Explosive propellants	25	-	-	-	-	-	-	-
6400 Compressed gases	26	-	2.49	-	-	-	0.85	0.184
7100 Elemental mercury	27	-	17.4	1.62	-	-	0.52	-
7200 Elemental lead	28	0.49	2.41	-	-	0.02	-	0.166
7300 Beryllium	29	-	0.0002	-	0.008	-	-	-
7400 Batteries	30	-	6.17	-	-	-	28.8	1.22
8000 Unknown	31	-	3.78	1.62	-	-	-	-
9000 Final forms	32[b]	-	1,580	5.93	-	-	-	-
6140 Scintillation cocktails	33[c]	-	3.22	-	-	-	-	0.54
Total		0.49	40	3.3	0.008	0.02	30.6	2.11

Waste Stream		Volume Generated (m^3/yr)					Total All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code	Hanford	SNL-NM	SNL-CA	SRS	WSSR	
6200 Reactive metals	24	0.85	0.0014	-	0.084	0.02	6.69
6300 Explosive propellants	25	-	0.014	-	-	-	0.014
6400 Compressed gases	26	-	-	-	-	-	3.524
7100 Elemental mercury	27	9.68	-	-	0.0317	0.04	27.9
7200 Elemental lead	28	44.1	0.0006	-	33.6	1.36	160
7300 Beryllium	29	-	-	-	-	-	0.128
7400 Batteries	30	8.27	0.0136	-	-	0.46	47.2
8000 Unknown	31	1.05	0.32	-	-	-	13.7
9000 Final forms	32[b]	-	-	-	50	-	1,650
6140 Scintillation cocktails	33[c]	146	0.0023	0.502	0.004	-	175
Total		210	0.352	0.502	33.7	1.88	433

[a] The following sites do not contain "other" wastes: Colonie, KCP, Mare Island, Middlesex, Norfolk, PPPL, Puget Sound, and RMI.

[b] Final forms, treatment code 32, require no further treatment and are not included in the total.

[c] Scintillation cocktails, treatment code 33, are processed with treatment code 21.

TABLE 3.13 Volumes of PCB-Contaminated Non-Alpha WM LLMW from MWIR-2 for Case 2a[a]

Waste Stream		Volume Generated[b] (m^3/yr)									Total All Sites (m^3/yr)
MWIR-2 Category	WM PEIS Code	Bettis	Charleston	FEMP	INEL	ORR	Mound	PORTS	Puget So	Hanford	
2000											
Organic liquids	3	-	0.0042	-	0.0042	71.1	-	15.1	-	-	86.2
	4	-	0.0042	-	0.0042	63	-	15.1	-	-	78.2
	5	-	0.0042	-	0.0042	342	0.11	15.1	-	-	357
	6	0.0021	0.0042	-	0.0462	342	-	15.1	-	-	357
3000											
Solid process residues	7	-	-	-	-	-	-	-	0.95	37.4	38.3
	11	-	-	-	-	-	-	39.3	-	-	39.3
	12	-	-	0.92	-	-	-	-	-	-	0.92
4000											
Soils	15	-	-	-	-	2.16	-	151	-	-	153
	16	-	-	-	-	-	-	151	-	-	151
5000											
Metal debris	17	-	-	-	-	0.04	-	-	-	-	0.04
	19	-	-	-	-	0.08	-	-	-	22.4	22.5
	20	0.652	-	0.02	-	-	-	-	5.7	7.34	13.9
6000											
Lab packs	21	-	-	-	-	1.14	-	-	-	76	77.1
	22	-	-	-	-	1.14	-	-	-	0.28	1.42
	23	-	-	-	-	1.14	-	-	-	0.28	1.42
Other											
8000 — Unknown	31	-	-	-	-	22.1	-	109	-	-	131
6140 — Scintillation cocktails	33	-	-	-	-	1.14	-	-	-	0.28	1.42
Total: Other		-	-	-	-	23.2	-	109	-	0.28	133
Total		0.873	0.0168	0.94	0.0588	847	0.11	510	6.65	144	1,510

Treated Waste for Disposal	Volume after Treatment[c] (m^3/yr)									
	Bettis[c]	Charleston[d]	FEMP[e]	INEL[e]	ORR[e]	Mound[f]	PORTS[e]	Puget So[g]	Hanford[e]	Total
Polymer grout	0.00648	0.00578	0.257	0.00578	342	0.0992	25.1	0.0541	3.98	371
Grout cement	0.157	0.00182	0.0481	0.00654	95.5	0.0132	194	1.64	47.4	339
Mercury solids	0.00006	<0.00001	0.00009	<0.00001	0.0994	0.00003	0.0576	0.00057	0.0186	0.18

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] Generation site and treatment site would be the same for all sites listed.

[c] Disposal site for Bettis treated waste would be WVDP.

[d] Disposal site for Charleston treated waste would be SRS.

[e] This site would be both the treatment and disposal site for these wastes.

[f] Disposal site for Mound treated waste would be PORTS.

[g] Disposal site for Puget Sound treated waste would be Hanford.

TABLE 3.14 Volumes of PCB-Contaminated Alpha LLMW for Cases 2a and 4[a]

Waste Stream		Volume Generated (m^3/yr)			
MWIR-2 Category	WM PEIS Code	RFETS	Mound	WVDP	Total
2000					
Organic liquids	5	0.105	-	-	0.105
3000					
Solid process residues	7	-	0.0227	-	0.0227
6000					
Metal debris	17	-	-	0.255	0.255
	20	1.05	-	0.282	1.33
Total		1.16	0.0227	0.537	1.71

	Volume after Treatment (m^3/yr)	
Treated Waste for Disposal	RFETS[b]	SRS[c]
Polymer grout	0.103	0.00256
Grout cement	0.203	0.121
Mercury solids	0.0001	0.00002

[a] A hyphen indicates that the site reports no waste in MWIR-2.

[b] RFETS would be both the treatment site and disposal site for the RFETS treated wastes.

[c] SRS would be the treatment and disposal site for the treated wastes from Mound and WVDP.

TABLE 3.15 CH LLMW Disposal Volumes

Disposal Site	Waste Type	Shipping Volume[a] per Case[b] (m^3/yr) Case 2a (16)	Case 4 (12)	Case 7 (6)	Case 10a (1)	Case 15 (6)	Case 17 (1)
ANL-E	Non-alpha	3.0	-	-	-	-	-
BNL	Non-alpha	8.4	-	-	-	-	-
FEMP	Non-alpha	108	108	-	-	-	-
Hanford	Non-alpha	1,250	1,250	1,330	-	1,330	5,290
	Alpha	-	-	-	-	-	3,200
INEL	Non-alpha	42.7	42.7	139	-	172	-
	Alpha	612	612	612	-	3,090	-
LANL	Non-alpha	11.1	12.5	34.0[c]	-	1.5[c]	-
	Alpha	56.2	56.2	56.2	-	-	-
LLNL	Non-alpha	177	177	-	-	-	-
NTS	Non-alpha	13.4	-	<0.01[c]	5,290	<0.01[c]	-
	Alpha	-	81.4	81.4	3,200	-	-
ORR	Non-alpha	2,040	2,040	3,340	-	3,340	-
Pantex	Non-alpha	20.3	20.3	-	-	-	-
PGDP	Non-alpha	21.7	21.7	-	-	-	-
PORTS	Non-alpha	579	1,177	-	-	-	-
RFETS	Non-alpha	0.06	0.06	0.08	-	-	-
	Alpha	2,340	2,340	2,340	-	-	-
SNL-NM	Non-alpha	1.41	-	-	-	-	-
SRS	Non-alpha	446	446	446	-	446	-
	Alpha	105	105	105	-	105	-
WVDP	Non-alpha	12	-	-	-	-	-

[a] A hyphen indicates no waste in this category.

[b] The number of disposal sites is given in parentheses beneath each case number.

[c] Includes disposal of aqueous treatment residues, as outlined in Table 3.2.

4 REPRESENTATIVE LLMW MANAGEMENT TECHNOLOGIES

This chapter provides information on the various technologies that can be used to treat, store, and dispose of the large amount of LLMW. Generic descriptions are summarized for representative technologies, including input waste feed, emissions, residual waste feed, and waste volume changes. Treatment technologies for mixed waste are continually evolving, and by the assumed treatment date for LLMW (2003), emerging technologies may replace some of the technologies described in this section.

4.1 OVERVIEW

A systematic approach was developed for this analysis to categorize LLMW by physical-chemical composition, RCRA contaminants, and planned treatment of the waste. The LLMW was divided into 9 different waste categories and 32 different treatment codes (see Section 1.2), and a consolidated flowsheet was developed to show the treatment processes for LLMW categories 1000 to 5000. The treatment and disposal process was divided into five basic steps that constitute the characteristic treatment track for each particular LLMW stream: front-end handling, pretreatment, primary treatment, secondary treatment, and final waste forms. Each of the treatment steps consists of one or more treatment modules. For example, pretreatment contains modules for liquid/solid separation and size reduction; primary treatment contains modules for neutralization, wet oxidation, evaporation, incineration, secondary combustion, and thermal desorption; and secondary treatment contains modules for condensation, mercury stabilization, off-gas treatment, polymer solidification, and grouting.

Figure 1.1 shows the integration of waste treatment modules for waste preparation, pretreatment, primary and secondary treatment, and the preparation of treated waste for final disposal. Treatment facilities for handling special (6000), inherently hazardous (7000), unknown (8000), and final waste form (9000) wastes are not shown on the flowsheet because the majority of these wastes are currently set aside to await special processing. The WM PEIS (DOE 1996) does not address disposal of these waste forms. Descriptions of the individual treatment trains (shown in Figure 1.1) are briefly summarized in this section.

4.1.1 Treatment Train for the 1000-Series Waste Stream

The 1000-series waste stream includes aqueous liquids with 0 to 1% organic constituents. To protect subsequent treatment operations, the first step in treatment would be removal of solids by liquid/solid separation. Separated wet solids would then be sent to the wet solids treatment facility for additional processing. Free liquids would be sent to the primary treatment unit to separate dissolved inorganic components from the aqueous stream. The pH of aqueous liquids would be monitored and adjusted, as required, to prevent corrosion problems. Precipitation could also be conducted in the same unit to remove dissolved metal ions from solution. Aqueous liquids containing organics would be sent to a thermal treatment

unit, such as wet air oxidation, to remove organic matter. Aqueous liquids suitable for processing in the main process line would be routed to the evaporator to remove all remaining solids and dissolved salts, and the water vapor would be sent to a condenser. The condensed clean water effluent meeting effluent discharge requirements would then be discharged. Effluent that did not meet discharge standards would be recycled. The solids-containing bottom stream would be transported to a solidification unit for further stabilization prior to shipment for disposal. Aqueous waste containing cyanide could be treated in an isolated special treatment unit by using chemical oxidation to destroy the cyanide ion.

4.1.2 Treatment Train for the 2000-Series Waste Stream

The 2000-series wastes consist of various organic liquids that would be treated by organic destruction. First, liquid/solid separation would segregate the organic wastes into concentrated organics, sludge, and mixed aqueous/organic streams. The concentrated organics and sludge streams would then be thermally oxidized by thermal treatment (e.g., incineration). The mixed aqueous/organic streams would undergo additional separation through processes such as automatic decantation to segregate the liquids into primarily aqueous and organic phases. The aqueous-dominant streams would then be processed through the 1000-series treatment train. Halogen-containing organic streams would be processed separately from nonhalogen-containing streams because the acid gas evolved during incineration of halogen species requires neutralization prior to the venting of off-gases.

4.1.3 Treatment Train for the 3000-Series Waste Stream

The processing of the 3000-series (solid process residues) waste stream would be more complex than the treatment for the first two groups of primarily liquid wastes. Treatment of solid process residues must deal with organic and inorganic semisolid and adsorbed materials that may contain both RCRA-regulated organics and inorganics. The first step in treatment would separate regulated inorganic chemicals from organic material. The segregated salts and inorganic residues would be stabilized before final disposal. Organic wastes would be destroyed by thermal treatment in the incinerator.

4.1.4 Treatment Train for the 4000-Series Waste Stream

The treatment for 4000-series wastes (soils) would provide for sorting and removal of debris from soils and transfer of the debris for further processing as required. Soils containing RCRA-regulated organics would be incinerated to destroy the organic constituents and would then be grouted to stabilize inorganic chemicals such as heavy metals. Liquid phase waste or sludges removed from the soil streams would be sent to the appropriate treatment line for processing.

4.1.5 Treatment Train for the 5000-Series Waste Stream

The processing of 5000-series wastes (debris) would provide options to destroy organic constituents, remove organic surface contamination from inorganic debris, and stabilize the treated debris residuals. Pretreatment would include sorting of debris to segregate the organic matrix debris that would then be incinerated. Inorganic debris, both metals and nonmetals, would be shredded to facilitate organic removal by thermal desorption. Organic contamination would be removed to a level such that organics would not adversely affect the grouting process. Finally, the super compaction-pelletizing operation would reduce the volume of the treated debris in preparation for final stabilization by grouting.

4.2 WM PEIS TECHNOLOGIES

This section identifies and describes treatment technologies that might be used to process DOE LLMW. The technologies presented here are not meant to be inclusive of all waste destruction and stabilization technologies but rather only to highlight some of the more promising technologies for application to DOE waste streams. These technologies are arranged by the order of waste treatment stages in a treatment train.

4.2.1 Waste Preparation

4.2.1.1 Front-End Handling

The front-end support facility would include all administrative and laboratory buildings for the waste management support functions. Containers arriving at the facility would be removed from the transport vehicle and placed in a staging/storage area. The containers would be visually examined, labeled, logged, recorded, and sent to inspection and assay. After inspection and assay, the waste containers would be grouped according to their processing needs and assigned to waste stream categories of 1000 to 8000. Containerized waste requiring special processing operations would be set aside.

The front-end handling process would include an open, dump, and sort (ODS) facility where the incoming waste containers would be opened, segregated, and routed to the appropriate treatment module. The waste containers would be shredded and transferred for further processing.

4.2.1.2 Waste Pretreatment

A liquid/solid separation process would be used to remove solids from organic liquids and aqueous wastes to produce a clear effluent or to concentrate a dilute suspension into a slurry form for further processing. Solid particulates could be separated from a fluid by filtration or sedimentation.

A solid separation process would be used for each of the 3000-, 4000-, and 5000-series waste streams to separate and route different solids to the appropriate treatment facilities. Separation processes commonly used for this purpose are screening through uniformly perforated openings and gravity separation by oscillation (Thompson 1992).

4.2.2 Primary Treatment Technologies

4.2.2.1 Neutralization/Precipitation

Neutralization is the addition of chemicals to control excess acidity or alkalinity in wastewater before it undergoes further treatment processes. Commonly used neutralizing chemicals are caustic soda, lime, calcium, or sodium carbonate and limestone for acid wastes and sulfuric, hydrochloric, and nitric acids for alkaline wastes (Corbitt 1990).

Chemical precipitation is applicable for the treatment of aqueous wastes containing toxic metals such as arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc (Freeman 1988). A chemical precipitant is added to the metal-containing aqueous waste to convert the dissolved metals to an insoluble form. Neutralization and precipitation cause little change in waste volume, mass, or radioactivity, and produce few contaminant emissions.

4.2.2.2 Evaporation

Evaporation is a physical separation process that concentrates a liquid effluent by applying energy to drive off relatively volatile solvents. In general, evaporation is applied as a noncontact process in which low-pressure steam is driven across the outer surface of metal tubes through which flows the material to be evaporated. A steam condensate and a bottom stream are produced; one or both may require further processing before disposal.

After evaporation, the vaporized solvent is condensed and may be reused in process application or discharged (Magleby 1988). Generally, only 85 to 90% of the organics are recovered (Gillins et al. 1993). The treated sludge that collects at the bottom of the evaporator is substantially reduced in volatile organics content. The residual sludge can then be processed through solidification or dewatering prior to disposal. Table 4.1* summarizes the representative evaporation process parameters.

4.2.2.3 Wet-Air Oxidation

Wet-air oxidation is an aqueous phase oxidation process that destroys organic matter in aqueous solutions under elevated temperatures and pressures. It differs from conventional

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* For readability, all tables are placed at the end of this chapter.

oxidation in that the reaction occurs entirely in the liquid phase; the heat of combustion is released to the pressurized liquid in the reaction zone. Application of this process requires moderate- to high-pressure reactor vessels, efficient heat exchange, the ability to dissolve stoichiometric oxygen in the reaction vessels, and sufficient heating value of the organic waste stream to support the heat loss of the process (Freeman 1988).

The wet-air oxidation process begins by charging the reactor with a known mass of input waste. The contents are then brought to the operating temperature and pressure, and oxygen is introduced to the reactor to start the oxidation reaction. During oxidation, the pH is controlled by adding caustic (Feizollahi and Shropshire 1994). A catalyst is added to enhance the reaction and to complete the destruction of certain organics. Nitrogen is usually added to the reactor to control process parameters. The process typically operates at temperature of 280°C (536°F) and at pressures of up to 1,800 pounds per square inch (Feizollahi and Shropshire 1994). After oxidizing the organic liquids, the contents of the oxidation reactor are discharged as an aqueous waste with a high total dissolved solids content. This waste is sent to a treatment unit such as an evaporator for further processing. Gas generated during the wet-air oxidation process contains some low-molecular-weight organic compounds that will be transferred to an off-gas treatment unit to remove RCRA-regulated compounds before release to the atmosphere. Table 4.2 summarizes the representative unit operation parameters for wet-air oxidation.

4.2.2.4 Incineration

The thermal destruction of organics by incineration is a technology by which combustible organics are completely oxidized using high-temperature combustion. The input wastes to be processed by incineration include process solid residues, organic and heterogeneous debris, organic liquids, and lab packs. The incoming wastes are brought to the incinerator from a preparation-and-feed unit. The process begins by gradually charging the incinerator chamber with input waste in solid or liquid form. Concentrated organic liquids can be injected into the chamber as a fuel supplement. When sufficient waste is accumulated, the incinerator temperature is raised to the combustion temperature, approximately 900 to 1000°C (1,600 to 1,800°F). Low concentration organic liquids can be added to cool the incinerator when needed (Feizollahi and Shropshire 1994).

A variety of incinerator types and configurations have been developed to accept specific combustible wastes. Three of the most commonly used are the controlled air, rotary kiln, and fluidized bed incinerators (Freeman 1988). Controlled air incinerators are typically used for low-density packaged waste streams. Rotary kiln incinerators can accept wastes with a wide variety of physical forms and sizes. Fluidized bed incinerators are applicable to liquid and slurry wastes, sludges, and solids that have been reduced in size. Process descriptions for these three types of incinerators are briefly summarized below. The representative incineration process parameters are summarized in Table 4.3.

Controlled Air Incinerator. A controlled air incinerator is usually designed as a two-stage combustion process. Solid waste is fed into the primary chamber and burned at roughly 50 to 80% of the stoichiometric air requirement (a starved-air condition). The resultant smoke and pyrolytic products, consisting primarily of volatile hydrocarbons and carbon monoxide along with some combustion products, pass to the secondary chamber (Gillins et al. 1993). Excess air is provided in the secondary chamber to ensure complete combustion.

Rotary Kiln Incinerator. Rotary kiln incinerators provide a number of necessary functions such as the conveyance and mixing of solids, a mechanism for efficient heat exchange, and a means to conduct the off-gases out of the system for further processing. In addition, this type of incinerator also serves as a host vessel for chemical reactions that can be equally applicable to solids, sludges, and slurries and are capable of receiving and processing liquids and solids simultaneously.

Heat transfer in the processing zone is primarily by radiation from the kiln wall. Hazardous constituents are volatilized into the kiln gas stream, followed by destruction in a postcombustion chamber with independent burners and fans. The incinerated solids are discharged to a high-temperature conveying device that transfers the materials to a cooler-moisturizer device. A rotary cooler provides the reverse heat transfer mechanism so that the incinerated materials can be discharged at less than 65°C (150°F) for further handling.

Fluidized Bed Incinerator. Fluidized bed incinerators generally consist of an air fluidized system, a fluidized bed vessel, a waste feed system, and off-gas cleanup equipment. Liquid and sludge wastes are introduced through a waste feed tank, and solid wastes are transferred from a solid waste feed hopper. Air from the fluidizing-air fan is preheated through a burner and is distributed across the bottom of the bed via an air-distribution system. As the velocity of air increases, the granular bed material becomes suspended in a churning gas-solid mixture with physical properties similar to a fluid.

The operation temperature in a fluidized bed incinerator varies, depending on the particular wastes undergoing combustion. Refinery wastes can be destroyed in fluidized bed incinerators that operate between 720 and 830°C (1,300 and 1,500°F). For chlorinated solvents, destruction efficiencies greater than 99.99% are achievable in fluidized beds operating at 800°C (1,430°F) or as low as 760°C (1,370°F), with the secondary reaction chamber at 1,200°C (2,200°F) (Gillins et al. 1993). A secondary reaction chamber may be required to ensure complete combustion for some specific hazardous components.

After incineration, the resulting ash is discharged to the stabilization facility. Gas generated during the incineration process is first heated in a secondary combustion chamber to a higher temperature of about 1,100°C (2,000°F) with a residence time of at least 2 seconds (Feizollahi and Shropshire 1994). This gas is then sent to an off-gas treatment unit to remove particulates, toxic metals, acidic gases, and other regulated elements and compounds.

The off-gas treatment unit ensures that the off-gas discharged to the atmosphere meets emission standards.

4.2.2.5 Thermal Desorption

Thermal desorption is used to remove volatile organic compounds from debris and soil. Materials containing low melting point components — such as low-temperature plastics, salts, or highly corrosive components (e.g., fluorine) — are incompatible with this process and must be removed from the feed (Feizollahi and Shropshire 1994). The sorted waste stream is screened and shredded prior to being transferred to a thermal desorption facility.

A desorption kiln operates at an approximate temperature of 220 to 330°C (400 to 600°F). Off-gas containing volatile organic compounds is condensed in primary and secondary condensing units. The condensed organic liquids are sent off for incineration. Off-gas from the condensing process is filtered by activated carbon to remove remaining traces of organics. Treated off-gas is then passed through a HEPA filter for particulate removal before discharge to the atmosphere. Treated soils and debris and other process residues are sent to the stabilization facility. The representative thermal desorption process parameters are summarized in Table 4.4.

4.2.2.6 Shredding

Solid wastes are typically subjected to size reduction by shredding prior to introduction to any treatment process. The purpose of shredding is to make the material more uniform. This is done by chopping up the items and mixing the fragments together. Shredding equipment consists of impactors, shredders (e.g., rotary shear or hammer mill), and shears. These machines are manufactured with horizontal or vertical input shafts to impact or shear the waste material (Corbitt 1990).

The shredding facility is usually equipped with a dust collection/filtration unit to treat air containing fugitive dust. The shredded wastes are then transferred to a thermal desorption unit to remove volatile contaminants and then to a thermal treatment unit or pelletizing unit for further processing. The representative process parameters for material size reduction and shredding are summarized in Table 4.5.

4.2.2.7 Pelletization and Compaction

Pelletization is an operation process commonly used in metallurgy to produce balls of about 1.2 cm (0.5 in.) in diameter from finely divided ore or coal. In mixed waste treatment, the solid particles from a thermal desorption unit are pelletized to uniform sizes before they are transferred to a solidification process. Usually, the fine-grained particles are first rolled with the addition of a wetting liquid composed of water or other additives to form wet pellets. The wet pellets are then dried and hardened by passing combustion gases through a bed of the agglomerates.

Compaction is a process that compresses material into a smaller volume. Three types of compactors are commonly used to reduce waste volumes: drum compactors, box compactors, and supercompactors. Drum compactors compact wastes directly into 0.21 m^3 (55-gal) drums. Box compactors are similar to drum compactors except that waste is compacted into a reinforced metal box. Supercompactors compress all the material loaded in a drum or box by compacting the entire drum or box and its contents.

The volume reduction obtained from compaction depends on the applied force, the bulk density of the waste material, and the springback of the material when the pressure is released (Trigilio 1981). Size reduction by shredding prior to compression tends to increase the volume reduction achieved by compaction. Any liquid discharge during compression is directed to a sump. Liquid waste treatment and solidification unit operation are provided if needed. Table 4.6 summarizes the representative supercompaction process parameters.

4.2.3 Secondary Treatment Technologies

Secondary treatment technologies refer to technologies applied following the primary waste treatment. Secondary technologies include condensation, off-gas treatment, mercury stabilization and solidification.

4.2.3.1 Condensation

Condensation is used to process the vaporized solvent driven off during evaporation. In a condenser, the vapor temperature is reduced to condense compounds with a higher boiling point, thus allowing the constituents with a lower boiling point to remain volatilized. For example, a mercury condensation unit will lower the temperature of the contaminated gas stream to a point where the mercury vapor condenses and can then be drawn off. The remaining volatilized vapor, mainly water and organics, can be further processed by passing it through activated carbon to remove the organic contaminants by absorption. The resultant effluent can be discharged or used in water recycling. The condensed mercury is sent to the mercury stabilization facility for further processing.

The two types of condensers are contact or noncontact. In a contact condenser, the vapor, coolant, and condensate are all mixed inside the unit shell. The contact condenser has two significant disadvantages. First, a large volume of coolant is required. Second, the comingling of contaminants with coolant creates a contaminated coolant (usually water) waste stream (Corbitt 1990). Noncontact condensers cause condensate to collect on a surface isolated from the coolant. These condensers are usually designed as the shell-and-tube type in which cooling waters flow inside the tubes and vapors condense on the outside of the tube. In a noncontact (i.e., surface) condenser, the cooling water or other coolant is often reused.

The condensation process is assumed to cause little change in volume, mass, or radioactivity of the LLMW being treated. It produces only minor contaminated emissions.

4.2.3.2 Off-Gas Treatment

Off-gas treatment is designed to provide final cleanup of the off-gas released from a thermal treatment process. Secondary pollutants generated during the thermal treatment process include toxic metals, radionuclides, hydrocarbons, particulate matters, and acid gases. Toxic metals are generally released from a thermal treatment unit as the result of either (1) the entrainment of ash particles in the combustion gases or (2) the volatilization of metal species that can be exhausted from the thermal unit as a vapor. Many radionuclides emerge as particulate metal isotopes that partition throughout the off-gas system like other particulates. Particulate emissions are usually captured by filters or electrostatic precipitation. Gaseous emissions must be removed from the waste by either absorption, condensation, or neutralization. Unburned or partially destroyed hydrocarbons and some radionuclides — including carbon-14, tritium, and the radioiodines — volatilize and pass through the combustion zone without being destroyed by the combustion reactions. Some hydrocarbons may condense onto the surface of particulate matter once the off-gas is cooled down from combustion temperature. An afterburner is often effective in destroying hydrocarbons in the waste. Acid gas by-products, such as hydrogen chloride (HCl) and the oxides of sulfur and nitrogen (SO_x and NO_x, respectively), require off-gas treatment by neutralization with alkali or lime.

The operational parameters of a given thermal treatment unit indirectly control emissions of harmful constituents to the environment. Under the Toxic Substances Control Act (TSCA), the U.S. Environmental Protection Agency (EPA) has established performance requirements for the operation of (1) RCRA hazardous waste incinerators, boilers, and industrial furnaces and (2) incinerators that burn PCBs. These requirements are listed in 40 CFR 264.340-264.350 and 40 CFR 761.60-761.70, respectively. In this report, it is assumed that all processes and monitoring requirements designated by these regulations will be met in the thermal process for which the off-gas system is designed. A detailed description of various off-gas treatment technologies can be found in Gillins et al. (1993).

4.2.3.3 Mercury Stabilization

The mercury stabilization unit is used to immobilize mercury waste from two sources: the mercury collected from the aqueous liquid evaporator/condenser and the mercury condensed from the incinerator off-gas treatment system. The mercury from the aqueous evaporation/condensation process is transferred to an amalgamation facility in which the mercury is combined with copper (or zinc) powder, steel shot (for proper mixing), and nitric acid to form a copper-mercury amalgam solid (Feizollahi and Shropshire 1994). The amalgam is packaged for assay and inspection to meet toxicity characteristic leaching procedure (TCLP) standards.

The incinerator off-gas containing mercury vapor is condensed and scrubbed in a chemical process to produce insoluble mercury sulfide as a final waste form. The aqueous blowdown streams generated during the process are pumped to a packed bed cartridge containing a specific mercury adsorbent. The spent mercury adsorbent cartridge is sent for

final stabilization. Table 4.7 summarizes the representative mercury stabilization process parameters.

4.2.3.4 Solidification

Wastes are solidified for the following purposes: (1) to improve waste handling and physical characteristics, (2) to decrease the surface area across which pollutants can transfer or leach, and (3) to limit the solubility and prevent migration of the hazardous constituents (Freeman 1988). In the process of solidification, materials are added to the waste to produce a monolithic block of treated waste with a high structural integrity. A chemical bonding between the toxic contaminant and the additive may or may not be involved. Currently, available solidification methods are classified into four processes: cement-based (grouting), pozzolanic, thermoplastic, and organic polymers. Cement-based (grouting) and organic polymer solidification processes are described here as the representative solidification methods. The representative cement-based solidification process parameters are summarized in Table 4.8.

Cement-Based Solidification (Grouting). A cement-based solidification facility provides tertiary waste treatment by solidifying soil and liquid waste and sludge to meet RCRA land disposal restrictions before disposal. The cement-based solidification process (grouting) is typically accomplished by using Portland cement and additives. Siliceous compounds — including fly ash, blast furnace slag, soluble sodium or potassium silicate, and proprietary agents — are commonly used in conjunction with the Portland cement. Portland cement absorbs a significant amount of water during hydration reactions, thus minimizing the quantity of drainable water in a solidified mass. A mixture of silicates and cement can stabilize a wide range of materials, including metals, oils, and solvents. The cement-based solid grout has a low water permeability. Contaminant mobility is also attenuated as a result of adsorption onto hydroxide precipitates, precipitation in the form of relatively insoluble hydroxide compounds, or encapsulation in the cementitious mineral structure (MK-Ferguson Company and Jacobs Engineering Group 1992).

In solidification, concentrated liquid waste and sludge are delivered through a pipeline. A chemical addition unit is used to adjust the chemistry of the feed before the waste is fed to the solidification unit. Sites with small amounts of LLMW may use micro-solidification (essentially mixing the waste and grout materials together in the disposal drum).

Polymer Solidification. The polymer solidification process is used for micro- or macro-encapsulating solids and for stabilizing salt wastes, concentrated organic materials, and other solids with high water solubility. In this process, the dried input waste and polymer agent are metered into drums and then mixed in a blender. Once blended, the polymer and waste mixture is transferred to the encapsulation unit that melts and pushes the waste and polymer matrix into 0.21-m^3 (55-gal) drums. When filled, the drums are

transferred to an enclosure where cooling is achieved by forced air ventilation. After cooling, the drums are capped and washed. Then the drums are moved to the certification and shipping facilities for final disposal.

4.2.4 Interim Storage

The representative temporary or interim storage module for LLMW consists of three units: the waste storage cell, spill-cleanup equipment, and monitoring facilities. A LLMW storage module may be used in conjunction with the storage front-end (unloading and inspection) and back-end (certification and shipping) support facilities, as an addition to an existing radioactive waste storage facility or as an independent facility.

Containers are delivered on a transport vehicle and are unloaded and placed in a staging area. The containers are visually examined, labeled, logged, recorded, and sent to inspection and assay. At the inspection/assay operation, the category of the received waste is verified against the results obtained from the back-end treatment facility. After inspection, the containers are moved to a storage area. The cleanup unit is designed to respond to potential spills. The monitoring unit is designed to permanently monitor the wastes to ensure the integrity of the waste storage containers (Feizollahi and Shropshire 1992).

The storage areas include features such as spill collection equipment and a combination of sloping floors and sumps that achieve compliance with the storage requirements of RCRA (Feizollahi and Shropshire 1992). Table 4.9 summarizes the representative waste emissions for interim storage processes.

4.2.5 Disposal

Engineered disposal facilities for LLW and LLMW are similar; however, the mixed waste disposal facility is designed to meet RCRA standards and must have a secondary leachate collection system (Feizollahi and Shropshire 1992). Radioactive wastes disposed of in near-surface facilities are more likely to be exposed to natural processes such as erosion, flooding, freeze-thaw cycles, and plant and animal intrusion than are wastes disposed of in a deep geologic repository. Near-surface disposal facilities include shallow land burial, earth covered tumuli, or, less commonly, belowground vaults (Kittel 1989).

Shallow land burial consists of placing waste containers in an excavated trench and backfilling the voids between containers with sand or using other earthen materials as cover. The cap is multilayered and serves as a low-permeability barrier to restrict the infiltration of water into the disposal trenches. The cover system also restricts human, plant, and animal intrusion into the waste and reduces gamma exposure rates at the surface of the disposal unit to an acceptable level (EG&G Idaho Inc. 1987). Intermediate-depth disposal, also called greater confinement disposal, generally consists of deep trenches or augered shafts.

In tumulus disposal, wastes are placed in an engineered concrete structure that is located above the natural grade of the disposal site. Each disposal unit is filled with waste containers and then backfilled and sealed with concrete. A concrete cover is concurrently constructed over the sealed cells. The cells are then capped with an outer multilayered cover of earthen materials such as soil, clay, or rock (riprap) engineered to withstand long-term environmental weathering effects (Feizollahi and Shropshire 1992). A double liner system with a double leachate collection system is also installed in each waste cell in accordance with RCRA liner requirements (IT Corporation 1993). For wastes with higher radioactivity, tumuli can be constructed over a belowgrade concrete bunker (EG&G Idaho Inc. 1987).

Belowground vault disposal consists of placing the waste in engineered concrete structures located below the natural grade of the disposal site. Because the vault is constructed belowgrade, it is covered with an earthen cover similar to that used for shallow land burial. The inclusion of both a concrete vault and an earthen cover as barriers enhances the ability of this design to restrict water infiltration into the waste, prevent human or biological intrusion, and reduce gamma exposures at the surface of the disposal unit to acceptable levels (EG&G Idaho Inc. 1987).

Treated LLMW that contains hazardous components will be subject to the land disposal restrictions of RCRA (40 CFR 268) (Brandon and Fillo 1993). The radiological impacts associated with LLMW disposal should be similar to those associated with LLW disposal. These impacts are discussed by Goyette and Dolak (1996).

TABLE 4.1 Evaporation Process Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.72 All others: 1.0E-11	Based on estimated radionuclide fractions in evaporator emissions at fuel storage, reprocessing, and fabrication facilities.	Adapted from DOE (1979, Vol. 1)
Evaporator bottoms[a]			
Output volume as function of input	0.01-0.15	A 95% water recovery percentage was suggested by PNL (1992).	-
Activity as function of input (Ci_{out}/Ci_{in})	~1	Essentially all activity is in the evaporator bottoms.	DOE (1979, Vol. 2)
Concentration of dissolved solids	1.0E-07 mg/L	Typically 20 to 25 wt.% dissolved solids. Density is typically 1.2 g/cm^3 (Gilbert/Commonwealth Engineers/Consultants 1980).	-
Recovered water			
Activity output (Ci_{out}/Ci_{in})	H-3: 0.28 All others: 1.0E-04	Activity is distributed into evaporator bottoms; some remains in recovered water. Some losses to air emissions also result.	Magleby (1988); Trigilio (1981)
Concentration of dissolved solids	1 to 10 mg/L	Typically <1 mg/L.	PNL (1992); Magleby (1988)

[a] Evaporator bottoms include solid residuals and salt residuals. The solid residuals contain insoluble metals and will be transferred to a grouting facility. The salt residuals contain metal precipitates and will be transferred to polymer stabilization.

TABLE 4.2 Wet Air Oxidation Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.983 All others: 1.0E-11	Based on data estimated for thermal incineration process.	DOE (1992b)
Liquid product			
Mass as function of input ($mass_{out}/mass_{in}$)	~1.0	Assumes only noncondensible gases are oxidized and vented from the letdown tank subsequent to the oxidation process.	-
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.017 All others: 1.0	Assumes all activity stays in the output stream unless the stream is contaminated primarily with tritium.	-

TABLE 4.3 Incineration Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.983 Arsenic: 4.6E-08 Mercury: 1.2E-07 All others: 5.0E-05	Based on estimated Ci/yr in process feed and Ci/yr emitted for both LLW and LLMW incineration at the SRS Consolidated Incineration Facility.	DOE (1992b)
Nonradiological concentrations	CO: 16.0 t/yr NO_x: 11.3 t/yr PM_{10}: 7.34 t/yr SO_x: 8.83 t/yr	Based on Waste Experimental Reduction Facility (WERF) maximum annual release rate.	DOE (1992b)
Emission factor (g/kg waste incinerated)	CO: 0.13 Lead: 5.0E-04 NO_x: 2.3 PM_{10}: 1.7 SO_2: 0.13 Total hydrocarbons: 0.02	Computational model data	Avci (1994)
Liquid residuals			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.001 Arsenic: 0.1 Mercury: 0.01	The activity of all other radionuclides in liquid residuals is suggested as 5.0E-02 for halogenated organic liquids and particulates and metal and nonmetal debris; and 1.0E-02 for all other waste streams.	-
Product (ash)			
Volume output (m^3_{out}/m^3_{in})	0.1-1.0	Volume reduction does not include solidification of ash or generation of residual wastes. Several references report varying volume reduction factors. A low value of 0.1 is used for organic liquids, waste containing organic particulates or sludges, and metal or nonmetal debris. A value of 1.0 is used for inorganic particulates, salt waste, contaminated soils, and aqueous lab packs.	Trigilio (1981); Long (1990); NRC (1981); Bechtel (1982); Feizollahi and Shropshire (1992)
Activity output (Ci_{out}/Ci_{in})	H-3: 0.016 Arsenic: 0.9 Mercury: 0.01-1.0 All others: 1.0	Assumes all activity is in ash product. Unit activity will increase due to volume decrease. A small fraction of activity goes to the off-gas. The activity output for mercury is 1.0 for salt waste, solid organic materials, and aqueous lab packs, and 0.01 for all other waste streams.	-

TABLE 4.4 Thermal Desorption Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.017 Mercury: 4.3E-08 All others: 4.3E-08	Based on data estimated from thermal incineration process. Assumes that the bulk of the tritium will be oxidized to form vapor or steam but condensed to liquid phase prior to emission.	DOE (1992a)
Nonradioactive concentration	1.82 t of noncondensible gas per year	Based on 100 m/d, 365 d/yr, and 0.0005 off-gas fraction of the feed. These gases will be routed to the incineration treatment process, which subsequently generates the SO_x, CO, NO_x, and PM_{10}.	DOE (1992a)
Liquid residuals			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 0.983 Mercury: 0.333 All others: 0.001	Assumes that the majority of tritium coming off as vapor or steam will be condensed in the primary condenser and stay within the liquid phase. Other radionuclides are expected to be in less of a soluble form and would remain with the solid residual phase.	DOE (1979, Vol. 2)
Solid residuals		The solid residuals are transferred for stabilization or supercompaction.	
Volume output (m^3_{out}/m^3_{in})	0.95		
Activity output (Ci_{out}/Ci_{in})	H-3: 0.001 Mercury: 0.667 All others: 0.999	-	-

TABLE 4.5 Operation Parameters for a Material Size Reduction Process Such as Shredding

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions	170 m^3/min	Based on contact size reduction facility at WVDP.	Frank et al. (1988)
Activity as function of input (Ci_{out}/Ci_{in})	4.3E-08	Based on WERF south stack data and the compactor/metal processing feed information. An alternate calculation is to determine the bulk contamination concentration in pCi/g and multiply by 4.3E-07 to give pCi emitted per gram of waste processed (adapted from DOE 1992a, Vol. 2).	Litteer et al. (1991)
Liquid residuals			
Volume as function of input	None	Free liquids are excluded from the feed to the material sizing technology.	-
Solid residuals			
Volume as function of input	None	HEPA filters from ventilation system would generate an additional waste stream. Assume filters are replaced annually.	-
Mass output (kg_{out}/kg_{in})	1.0	Mass unchanged by size reduction.	-
Volume output (m^3_{out}/m^3_{in})	0.167	Based on the reported average volume reduction factor for the contact size reduction facility (volume reduction factor of 6). WERF sizing operations reports a volume reduction factor of approximately 5.	Frank et al. (1988); DOE (1992a)
Activity output Ci_{out}/Ci_{in})	1.0	Activity is unchanged by size reduction activities. An increase in unit activity would result due to volume decrease. Minor losses of radioactivity to ventilation system.	-

TABLE 4.6 Supercompaction Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	1.5E-10	Based on Hanford compactor data.	Adapted from Washington Hanford Company (1991)
Treated product[a]			
Density	1,280 kg/m^3	A range of densities has been reported from 961 kg/m^3 to 1,730 kg/m^3.	Gillins et al. (1986); Magleby (1988)
Mass output (kg_{out}/kg_{in})	1.0	Mass remains the same. Volume decrease results in increased density.	
Volume output (m^3_{out}/m^3_{in})	0.5	Volume reduction factors can vary depending on the waste sorting and waste mix. Volume reduction factors in the range of 6 to 15 have been reported.	Gillens et al. (1986); EG&G Idaho Inc. (1987); Magleby (1988); Feizollahi and Shropshire (1992)
Activity output (Ci_{out}/Ci_{in})	0.98	Assumes activity remains the same with loss of 2% to liquid generation. Minor losses to air emissions. Unit activity increases due to volume decrease.	-

[a] Feizollahi and Shropshire (1992) assumed that 2% of the input mass flow rate would be converted to liquid residuals. This is conservative because 1% would be the typical upper limit for reactor waste.

TABLE 4.7 Mercury Stabilization Parameters

Parameter	Quantity	Comments or Assumptions
Air emissions		
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 1.5E-02 All others: 6.8E-14	-
Treated product		
Activity output (Ci_{out}/Ci_{in})	H-3: 0.985 All others: 1.0	No change in activity. Unit activity will decrease due to volume increase.
Mass output (kg_{out}/kg_{in})	1.66	Assumes mass increase of about 66%.
Volume output (m^3_{out}/m^3_{in})	2.0	Assumes volume increase of about 100%. Actual volume increase factor depends on ratio of waste to stabilization agents and site-specific treatability testing (Magleby 1988).

TABLE 4.8 Cement-Based Solidification Process Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			
Activity as function of input (Ci_{out}/Ci_{in})	H-3: 1.5E-02 All others: 6.8E-14	Derived for Hanford grout treatment facility.	Adapted from Hendrickson (1991)
Treated product			
Density	1,794 kg/m^3		Feizollahi and Shropshire (1992)
Leach characteristics (leachability index)	Co-58: 8.2-11.9 Co-60: 9.2-16.9 Cs-134: 8.2-10.2 Cs-137: 6-11.1 Fe-55: 10.0-17.2 H-3: 7.4-9.0 Mn-54: 11.9-16.6 Ni-63: 8.4-14.6 Nitrate: 7.6-10.2 Pu-241: 6.9-12.9 Sb-125: 10.4-11.2 Sr-90: 7-14 Tc-99: 8.3-14.3 Zn-65: 10.2-13.7	Leach characteristics depend on the nuclide, waste stream, and cement mixture. A high degree of variability is possible. Leaching also depends on the leachant. The data listed are combined from the several references listed in the next column.	Serne et al. (1992); Boomer (1992); Mitchell et al. (1989); Westnik (1984); Langton (1990); McIsaac et al. (1992); Cowgill (1991); Del Cul et al. (1991); Lomenick (1992); McIsaac and Akers (1991)
Volume output (m^3_{out}/m^3_{in})	1.3	Volume increases about 30%. Actual volume increase factor depends on waste-to-cement ratio and site-specific treatability testing.	Magleby (1988)
Activity output (Ci_{out}/Ci_{in})	H-3: 0.985 All others: 1.0	No change in activity. Unit activity will decrease due to volume increase.	Magleby (1988)

TABLE 4.9 Interim Storage Parameters

Parameter	Quantity	Comments or Assumptions	Reference
Air emissions			DOE (1988)
Activity as function of input (Ci_{out}/Ci_{in})			
Untreated waste	1.0E-04	Assumes 1% is released and 1% of that becomes airborne. Does not include any filtering of releases.	
Treated waste	1.0E-06	Assumes 10^{-4} is released and 1% of that becomes airborne. Does not include any filtering of releases.	

5 EXISTING LLMW MANAGEMENT FACILITIES

Information on the management of LLMW is provided in this chapter for 18 sites identified in the WM PEIS. The 11 major sites include FEMP, Hanford, INEL, LANL, LLNL, ORR, Pantex, PGDP, PORTS, RFETS, and SRS. The remaining sites include five representative sites — ANL-E, BNL, KAPL-S, LBL, and SNL-NM — and two other sites, ETEC and NTS. The data presented here are based primarily on information compiled by INEL (Sherick 1994). No commercial waste treatment facilities are included in this report.

Only existing and planned or approved facilities are included in this section. Facilities that are planned or approved include only those facilities that have completed RCRA Title 1 design and have authorization to proceed with Title 2 design. Existing facilities that are not currently operating are also included in the identification of existing facilities on the assumption that they could become operational, as required, and that they represent a committed cost for the purposes of economic analysis.

Table 5.1* summarizes TSD capacities of existing and planned or approved facilities assigned to LLMW at the 18 DOE sites. Not all of these facilities represent a complete treatment train for a waste. At many of the 18 sites, the LLMW cannot be completely processed. In such cases, the wastes will stay in interim storage at the respective sites. Available capacities are shown for aqueous waste treatment, incineration, and grout stabilization facilities.

Detailed information on treatment facilities is presented in Table 5.2. The capacity of the treatment facility is assumed to equal the design capacity of the facility, whether or not that contradicts the limits imposed by current site permits. For estimating capacities, it is assumed that each existing treatment facility treats only one specific waste type (LLMW, LLW, or TRUW, etc.) and that all of its design capacity is available for that primary waste type.

Facility limitations related to specific waste characteristics are not addressed in this report. No attempt has been made to reconcile existing facility capabilities with actual waste characteristics.

Most existing aqueous waste treatment facilities are dedicated to specific waste streams at the individual sites. WM PEIS alternatives do not consider shipping aqueous wastes between sites. Two sites, LANL and Pantex, both generate significant quantities of aqueous LLMW but report no existing on-site aqueous waste treatment facilities.

It is assumed that incinerators can be used to treat both solid and liquid wastes. The available capacity for the TSCA-permitted incinerator at ORR must allow for treatment of both PCB-contaminated LLMW and other PCB wastes not included in MWIR-2. There is a current backlog of liquid PCB waste to be incinerated at the TSCA incinerator within the

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* For readability, all tables are placed at the end of this chapter.

next few years. There is also an estimated 20-year backlog of solid PCB-contaminated waste. The Controlled Air Incinerator at Los Alamos is not included here because it has been designated as the TRUW treatment facility.

Table 5.3 shows major storage facilities for LLMW at the DOE sites. Storage capacities reported for LLMW are for container storage facilities. Information on existing tank storage capacities has not been compiled. Design capacity was used when it was available (about 80% of the reported capacities). If the design capacity was not available, the capacity reported was the permitted capacity.

Table 5.4 shows the disposal facilities for LLMW. Only three of the eighteen sites have LLMW disposal facilities: Hanford, NTS, and SRS. The annual capacities are determined by dividing the total available capacity by a 10-year operating span.

TABLE 5.1 Existing and Planned/Approved LLMW TSD Facility Capacities for 18 Representative DOE Sites

Site	Aqueous Waste (m^3/yr)	Available Treatment Capacity (m^3/yr)			Storage Capacity (m^3)		Disposal Capacity (m^3/yr)
		Incineration	Grout Stabilization	Metal Removal	Total	Remaining	
ANL-E	47	-	-	40[a]	101	-	-
BNL	-	-	-	-	335	-	-
ETEC	345	-	-	0.4[b]	1,118	-	-
FEMP	24,627	-	-	-	50,855	-	-
Hanford	100,120	-	15,360	690[a]	24,837	21,841	1,000
INEL	40,519	2,300	2,765	-	226,240	162,113	-
KAPL-S	-	-	-	-	5	-	-
LANL	-	-	-	100[c]	28,541	27,921	-
LBL	141	-	1,310	-	109	-	-
LLNL	153,822	-	-	-	2,555	-	-
NTS	-	-	-	-	3,000	2,702	12,648
ORR[d]	202,435	13,500	5,000	-	41,250	4,346	-
Pantex	-	-	175	-	651	376	-
PGDP	156	-	-	-	2,719	1,970	-
PORTS	7,849,614	-	-	-	7,370	2,773	-
RFETS	82,084	-	26,349	-	17,695	7,316	-
SNL-NM	-	-	1	-	4,101	2,893	-
SRS	601,980	8,200	41,208	-	13,760	5,625	6,800

[a] Reactive metal recovery.

[b] Mercury separation.

[c] Lead recovery.

[d] Includes ORNL, K-25, and Y-12.

TABLE 5.2 Mixed Waste Treatment Facilities

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments[a]
ANL-E				
Aqueous Waste Treatment				
Building 306	Precipitation and filtration	47	-	-
Alkali Metals Recovery				
Alkali Metal Reaction Booths	Deactivation by chemical oxidation	40	-	40 lb/h, 4,032 h/yr, 112.84 lb/ft^3
BNL				
No treatment facilities				
ETEC				
Aqueous Waste Treatment				
Radioactive Materials Disposal Facility	Evaporation, ion exchange, and neutralization	345	-	-
Radioactive Materials Disposal Facility	Mercury amalgamation	0.4	-	Capacity based on 1 L/d, 365 d/yr
FEMP				
Aqueous Waste Treatment				
Plant 8 Volatile Organic Compound Treatment System	Carbon absorption	23,862	Operating	Under CERCLA, no RCRA permit
UNH Treatment Facility	Neutralization, precipitation, filtration	765	Operating	Under CERCLA, no RCRA permit
Hanford				
Aqueous Waste Treatment				
300 Area Waste Acid Treatment System	Chromium reduction, centrifugation, filtration, and neutralization	120	Nonoperational	Based on 0.03 m^3/h, 4,032 h/yr
242-A/Purex Effluent Treatment Facility	Drying, evaporation, filtration, ion exchange, reverse osmosis, ultraviolet oxidation	100,000	Planned/approved, under construction	Based on 17 m^3/h, 6,132 h/yr
Reactive Metals Treatment				
303-M Oxide Facility	Calcination of uranium and zirconium fines	370	Nonoperational	Based on 91 kg/h, 4,032 h/yr, 1,000 kg/m^3
Maintenance and Storage Facility	Water reaction process	320	Construction complete	Based on 0.08 m^3/h, 4,032 h/yr

TABLE 5.2 (Cont.)

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments
Hanford (Cont.)				
Stabilization				
304 Concretion Facility	Stabilization	360	Nonoperational	Based on 0.09 m^3/h, 4,032 h/yr
Grout Treatment Facility	Stabilization	15,000		-
INEL				
Aqueous Waste Treatment				
Liquid Effluent Treatment and Disposal Facility, CPP-604	Chemical fractionation, distillation and evaporation	36,472	Operating	-
TAN 726-A Treatment	Ion exchange	126	Closure in FY 94	
Portable Water Treatment	Carbon-adsorption, filtration, ion exchange, neutralization	3,921	Planned/approved	RCRA Interim Status; environmental assessment under review
Incineration				
WERF Incinerator	Incineration	2,300	Undergoing restart	Liquid feed currently inoperable
Stabilization				
WERF Waste Stabilization Unit	Grout stabilization	2,765	Existing but not used	Based on 7,570 L/d, 365 d/yr
KAPL-S				
No treatment facilities				
LANL				
Lead Recovery				
Lead Decontamination Trailer	Lead decontamination and recycling	100	-	-
LBL				
Aqueous Waste Treatment				
Building 75, Unit 131 AFH	Neutralization	69	-	-
Building 85, Unit MW-6	Neutralization	72	Planned/approved	Title I Design complete

TABLE 5.2 (Cont.)

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments
LBL (Cont.)				
Stabilization				
Building 75, Unit 131E	Solidification of aqueous liquids	760	-	-
Building 85, Unit MW-7	Solidification of aqueous liquids	550	Planned/approved	Title I Design complete
LLNL				
Aqueous Waste Treatment				
Area 514 WWFU	Filtration Neutralization	3,396 6,822	- -	Limits placed on metal and organic content
Area 514-1 Waste Treatment Facilities	Carbon absorption and neutralization	147,000	Planned/approved	KD-3, RCRA Part B submitted 4/30/93
	Centrifugation	9,611	-	-
	Cold-vapor evaporation	3,790	-	-
NTS				
No treatment facilities				
ORR				
Aqueous Waste Treatment				
K-25 Central Neutralization Facility	Neutralization and separation	120,000	-	-
Y-12 Plating Rinsewater Treatment Facility	Oxidation/reduction, cyanide destruction, neutralization, filtration	7,575	-	Currently no radionuclides allowed
Y-12 Cyanide Treatment Facility	Chemical oxidation	13	-	Not a WM facility
Y-12 West End Treatment Facility	Precipitation, neutralization, and anaerobic digestion	9,469	-	-
Y-12 Central Pollution Control Facility	Carbon adsorption, precipitation, neutralization, and filtration	10,227	-	-
Y-12 Waste Coolant Processing Facility	Biodegradation	11,363	-	Currently restricted to depleted uranium
ORR Liquid LLW Evaporation Facility	Evaporation	39,788	-	-

TABLE 5.2 (Cont.)

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments
ORR (Cont.)				
Aqueous Waste Treatment (Cont.)				
K-25 K-1232 Wastewater Treatment Facility	Chemical precipitation, evaporation, and neutralization	4,000	Currently shut down	-
Incineration				
K-25 TSCA Incinerator	Incineration	13,500	RCRA, TSCA, NESHAPS in place, no outstanding NEPA	Based on 30 MBtu/h, 6,132 h/yr, 11,000 Btu/lb, 35 lb/ft^3
Stabilization				
K-25 Sludge Fixation Unit	Stabilization	5,000	Shut down	Scheduled for closure
Pantex				
Stabilization				
Building 11-15A, Immobilization	Immobilization	132	Inactive facility	No longer used for waste treatment
Building 11-9S, Immobilization	Pretreatment	43	-	-
PGDP				
Aqueous Waste Treatment				
C-400-C Evaporator	Evaporation	19.6	-	Undergoing RCRA closure
C-400-D Lime Precipitation Unit	Precipitation and neutralization	136	-	Planned to be closed
PORTS				
Aqueous Waste Treatment				
X-624 Groundwater Treatment Facility	Air stripping, carbon adsorption	99,470	Operating	-
X-701E Groundwater Treatment Facility	Carbon adsorption	99,470	Operating	-
X-662 Groundwater Treatment Facility	Carbon adsorption	78,576	Operating	-
X-705 Decontamination Facility	Filtration and neutralization	3,000	Operating	-
	Biodenitrification, filtration, ion exchange, liquid extraction, and neutralization	150		

TABLE 5.2 (Cont.)

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments
PORTS (Cont.)				
Aqueous Waste Treatment (Cont.)				
X-616 Liquid Effluent Control Facility	Precipitation and filtration	7,400,000	Operating	-
X-622T Groundwater Treatment Facility	Carbon absorption	69,628	Planned/approved	-
X-623 Groundwater Treatment Facility	Carbon adsorption	99,470	Planned/approved	-
RFETS				
Aqueous Waste Treatment				
Fabric Filtration: Buildings 444, 447, and 460	Filtration	12,128	Operating	Process liquid from Buildings 444, 447, and 460
Aqueous Process Waste Treatment, Building 774	Deactivation, neutralization, filtration, and precipitation	1,819	Operating	-
Modular Storage Tanks and Building 910 Evaporator	Evaporation and immobilization	68,137	-	-
Stabilization				
Chip Cementation, Building 447	Cementation	5.3	Planned/approved	-
Pondcrete/Saltcrete Reprocessing Facility, 750 PAD	Solidification	5,667	Planned/approved	-
Pondcrete/Saltcrete Reprocessing Facility, 904 PAD	Solidification	2,840	Operating	-
Pondcrete Solidification Process, Building 788	Solidification	17,837	Nonoperational	Closure pending
SNL-NM				
Miscellaneous Treatments				
Radioactive and Mixed Waste Management Facility	Compaction, decontamination, neutralization, stabilization, solidification	1	-	Bench scale

TABLE 5.2 (Cont.)

Site/ Treatment Facility	Treatment Type	Capacity (m^3/yr)	Status	Comments
SRS				
Aqueous Waste Treatment				
F/H Area Effluent Treatment Facility	Carbon adsorption, ion exchange, evaporation, filtration, reverse osmosis, neutralization, precipitation, mercury absorption	600,000	Operating	-
SRL Ion-Exchange Treatment Probe, Low Activity	Ion exchange	1,500	Operating	-
M-Area Liquid Effluent Treatment Facility	Neutralization, chemical precipitation, flocculation, and neutralization	80	Operating	Supernates
Incineration				
Consolidated Incineration Facility	Incineration	8,200	Planned/approved	KD-3, 12/1/92, construction 22% complete
Stabilization				
Z-Area Saltstone Facility	Stabilization	41,000	-	Limited to specific waste stream
Consolidated Incineration Facility Ashcrete Facility	Grout stabilization	208	Planned/approved	KD-3 12/1/92, 1,000 drums/yr

[a] CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; NESHAPS = National Emission Standards for Hazardous Air Pollutants.

TABLE 5.3 Mixed Waste Storage Facilities[a]

Site	Storage Facility	Capacity[b] (m^3) Total	Remaining
ANL-E	Interim TSD Facility	19	-
	Storage Building	32	-
	Others	50	-
	Site total:	101	-
BNL	Connex Containers	326	-
	Mixed Waste Storage Building	8	-
	Others	0	-
	Site total:	334	-
ETEC	Radioactive Materials Disposal Facility - TO22	765	-
	Radioactive Materials Disposal Facility	297	-
	Others	56	-
	Site total:	1,118	-
FEMP	Plant 1 Storage Pad	10,409	-
	Thorium Warehouse	38,232	-
	Others	2,214	-
	Site total:	50,855	-
Hanford	Central Waste Complex	22,710	-
	Retrievable Storage Units	1,532	-
	Others	595	-
	Site total:	24,837	21,841
INEL	Rad Mixed Waste Storage Facility	510	-
	Radwaste Management Complex	224,900	-
	Others	830	-
	Site total:	226,240	162,113
KAPL-S	Mixed Waste Storage Facility	5	-
	Site total:	5	-
LANL	TA-54	27,004	-
	TA-55	645	-
	Others	1,201	-
	Site total:	28,541	27,921
LBL	Detailed Data Unavailable	109	-
	Site total:	109	-
LLNL	Classified Storage Area	761	-
	Area 612 Storage Area 612-1	1,087	-
	Others	706	-
	Site total:	2,555	1,707
NTS	Area 5 Storage	3,000	-
	Site total:	3,000	2,702
ORR			
K-25	Concrete Block Casting and Storage	30,110	-
	K-305 Vault 19 and 19B Hazardous Waste	1,740	-
	Others	6,315	-
	K-25 total:	38,165	3,592

TABLE 5.3 (Cont.)

Site	Storage Facility	Capacity[b] (m^3) Total	Remaining
ORR (cont.)			
ORNL	TRUW Retrievable Drum Storage Facility	370	-
	TRUW Retrievable Drum	350	-
	Others	321	-
	ORNL total:	1,041	106
Y-12	RCRA and PCB Container Storage Area	328	-
	Waste Oil Facility, OD-7	776	-
	Others	941	-
	Y-12 total:	2,045	649
	ORR total:	41,251	4,346
Pantex	Magazines	421	-
	Munitions Magazines	38	-
	Others	192	-
	Site total:	651	376[c]
PGDP	Haz MW Storage Facility	971	-
	TSCA Storage	1,559	-
	Others	189	-
	Site total:	2,719	1,970
PORTS	Hazardous and MW Storage	7,000	-
	MW Storage Facility	371	-
	Others	0	-
	Site total:	7,371	2,773[c]
RFETS	Unit 25 MW Storage Area	10,704	-
	Unit 20 Shipping Storage Area	1,912	-
	Others	5,079	-
	Site total:	17,695	7,316[d]
SNL-NM	TA III Classified Storage Site	1,260	-
	TA III Unclassified Storage Site	1,260	-
	Others	1,581	-
	Site total:	4,101	2,893
SRS	TRUW Storage PADS	4,200	-
	TRUW Storage PADS	7,700	-
	Others	1,860	-
	Site total:	13,760	5,625

[a] Data presented are based on information that existed in 1992 and that has not been updated. Data presented are limited to drum container storage only; tank storage data are not provided. When design capacity is not provided, permitted capacity is used.

[b] A hyphen indicates data not available.

[c] Remaining capacity is estimated from the original data supplied by the site.

[d] RFETS has more waste than existing capacity, and it reports a deficit remaining capacity of 7,316 m^3.

TABLE 5.4 Mixed Waste Disposal Capacities[a]

Site/ Disposal Facility	Total Capacity (m^3)	Status	Comments
Hanford			
Shallow Land Burial LLMW Disposal Facility, Project W-025	10,000	Planned/approved	Under construction; capacity based on 1,000 m^3/yr for 10 years
Engineered Disposal	Not available	Unknown	Available capacity undetermined
NTS			
Shallow Land Burial Mixed Waste Management Unit, PO3U	126,500	Interim status	Construction completed; capacity based on 12,650 m^3/yr for 10 years
SRS			
Engineered Disposal Z-Area Saltstone Vaults, 451-1Z	68,000	Unknown	May be dedicated to a specific waste stream; capacity based on 6,800 m^3/yr for 10 years

[a] Only the sites listed in this table have mixed waste disposal facilities; the remaining 16 sites do not.

6 DATA ANALYSIS

6.1 INTRODUCTION

This chapter discusses the data inputs to the computational model; the actual data inputs and outputs are presented in the Appendix. The model was used to calculate the volume and mass throughput and emission source terms for each of the waste stream categories as the waste stream undergoes treatment and disposal. Uncertainties arising from the data and from the use of the computational model, as well as the impact of some uncertainties on the emission source terms and on comparisons among WM alternatives, are discussed qualitatively in Chapter 7.

6.2 COMPUTATIONAL MODEL

The WASTE_MGMT relational database management system (Kotek et al. 1996) was used to provide source terms for air emissions, contaminant concentrations, and volume throughputs at each treatment, storage, and disposal (TSD) facility. The model generates this information for both radiological and chemical contaminants as a function of four separate parameters: site, TSD facility, radiological classification of waste, and program alternative. The model runs on an IBM-compatible personal computer using the Microsoft FOXPRO® relational database system. Three types of data files are used to analyze a case: a waste inventory and contaminant characterization file, a TSD module characterization file, and a case definition file. The waste inventory and characterization file specifies the waste inventory and generation rate for each treatment code at each site. This file also summarizes the chemical and radiological profiles of waste for each treatment code are summarized. In the TSD module characterization file, the operational parameters for the modules used for the TSD of LLMW are summarized. The case definition file specifies the process trains for TSD and source-destination transportation links for waste belonging to each treatment code at each site.

The computational model tracks waste in each treatment module through the entire treatment train for each waste stream. The Mixed Waste Treatment Project provided the baseline treatment flowchart for LLMW (see Figure 1.1) and the proportional volume fractionation (volume splits) through each phase in the treatment process. Waste densities were estimated from data in MWIR-2 and from engineering judgment based on comparison of the LLMW with wastes generated in similar industrial processes. The WASTE_MGMT model uses volume splits for each treatment module and the densities of both primary waste processing streams to establish a consistent mass balance flow though the entire treatment train for a given waste. Expanding this procedure to all of the waste streams establishes a methodology for estimating the mass flow of the waste through the entire treatment complex.

In addition to fractionation by volume, the model also tracks the partitioning of radionuclide and chemical contaminants through treatment at each waste module. At every

step in the treatment train, a contaminant may partition into the air, liquid, and/or solid portions of the process. These fractionations are based upon the characteristics of the waste matrix, each contaminant's particular volatility and solubility, and the temperature of the treatment process. Because the contaminant partitioning factors are independent of volume fractionation coefficients, contaminant flows do not necessarily follow proportional volume flows through the treatment model. By coupling the fractionation of the contaminants to the mass flow of the waste, the model generates a balanced contaminant mass flow for the entire treatment train. Summing over all the waste streams, the model calculates the mass (and/or concentration) of each contaminant in air, water, and solid (including final product) discharges.

The results from the model have been utilized in the overall WM PEIS program as follows:

- Air emissions during normal operations and the throughput values have been used to calculate radiological doses and health effects to workers and the general public.

- Throughput quantities have been used to calculate TSD module costs, worker populations, and the resource requirements for the construction of new modules and the operation of all modules.

- Quantities and characteristics of the waste shipped among sites have been provided for the calculation of radiological doses and health effects to transportation workers and the general public along the transportation routes. Impacts from both incident-free transport and those resulting from probable transportation accidents have been calculated.

- Throughput quantities and characteristics have been provided for the estimation of air emissions of radionuclides during postulated TSD facility accidents.

- Quantities, contaminant emissions, and composition of LLW, LLMW, and TRUW have been estimated for the overall treatment/disposal process.

7 UNCERTAINTIES

An accurate assessment of uncertainties associated with the results discussed in this report for various LLMW management options is dependent upon two factors: (1) the reliability of baseline data on the volumes and composition of LLMW and (2) the accuracy of the model used to quantify the processing of LLMW. Uncertainty in either the LLMW baseline data or in the operational parameters and assumptions used in the waste treatment and disposal model can lead to imprecise and/or inaccurate output information on treated LLMW volumes, mass, composition, and the potential release of contaminants to the environment. Uncertainty in both LLMW data and model parameters can increase the inaccuracies of the final results. This chapter discusses specific areas of uncertainty within the current LLMW database(s) and the model. Uncertainties arise from the assumptions used to estimate the LLMW volume, inventory, and processing data as outlined in the earlier sections of this report. Given the current limitations on LLMW volume data and the very preliminary development of treatment facility operational plans, most uncertainties are presented qualitatively.

7.1 DATABASE UNCERTAINTIES

7.1.1 Uncertainties in the Waste Management Database

There are volume uncertainties in the WM LLMW database derived from MWIR-2 (DOE 1994a). Common factors that lead to uncertainties in each database include assumptions regarding projections of future waste generation volumes, the assumption that all waste shipments are reported as gross volumes, estimations of alpha versus non-alpha LLMW, and site-specific inconsistencies in data presentation. Aside from these common difficulties, each site database has particular assumptions and/or inconsistencies that can lead to uncertainty in the overall database. This section discusses some of the more important factors that can contribute to inaccurate and/or imprecise data for the volumes of LLMW.

For each site LLMW stream, MWIR-2 provides information on both the volume of LLMW in the current (1994) inventory and the volume to be generated from future operations. All waste streams, however, are not projected in a consistent manner; for example, some wastes are projected out to 20 years, but others to only 1, 5, or 10 years. To provide a consistent 20-year projection in the WM PEIS, the reported generation rate was assumed to continue throughout the 20-year period. This assumption, however, introduces an additional uncertainty into the 20-year projections.

Wastes are assumed to be reported as gross volumes for the MWIR-2 database. To convert gross waste volumes (waste and container volumes) to net LLMW volumes, a 10% reduction factor was used. This assumption adds uncertainty because the majority of LLMW streams have little or no data on the percentage of waste fill in LLMW containers. The 10%

reduction is based on estimates from typical industrial waste-filling practices. To convert the net LLMW volumes into waste mass for input into the WM PEIS computational model, densities derived from INEL site waste data were applied to the corresponding treatment code for all WM LLMW at all DOE sites. INEL waste densities, however, may not be appropriate for equivalent waste streams at other DOE sites. Together, the assumptions for conversion to net volume and the use of INEL waste densities for all other sites create uncertainty in the actual mass throughput at each site.

Finally, the data for certain sites may not be categorized correctly. In MWIR-2, no alpha LLMW are listed for two major sites, ORR and Hanford. However, given the large scale and diverse operations conducted at these sites, it is likely that they do have some alpha waste. It is possible that alpha wastes have been reclassified as mixed TRUW at these sites, but this has not been confirmed. Another source of uncertainty at Hanford is the disposition of secondary waste from the pretreatment of approximately 800,000 m^3 of single-shell tank (SST) waste and over 100,000 m^3 of double-shell tank (DST) waste that is not high-level waste. According to the most recent amendment to the Hanford Tri-Party Agreement (DOE 1994b), these SST and DST wastes will be treated by vitrification. It is expected that significant quantities of secondary waste, some of which may be LLMW, will be generated during pretreatment of these SST and DST wastes for vitrification. The current data do not account for this possibility.

7.1.2 Uncertainties in Radiological and Chemical Profiles

Because reliable data providing contaminant characterization of waste streams are not available, models were constructed for radiological and chemical profiles (Sections 2.3 and 2.4). The uncertainties in radiological and chemical profiles arise from the assumptions made in developing the profiles. Two assumptions in particular contribute to the uncertainties for radiological profiles: (1) radiological profiles depend only on the site and not on the particular waste stream and (2) activity concentrations in LLMW streams are derived from the corresponding low-level waste (LLW) streams at each site.

The first assumption, namely that radiological profiles do not depend on the waste treatment code, is likely to introduce the largest errors. Because different radionuclides have different solubilities, their proportions in aqueous and organic liquids will be different than in solids and sludges. For example, the proportion of H-3 may be underestimated in liquid wastes and overestimated in solid wastes, thereby affecting H-3 estimates in air and water emissions. Variations in radiological profiles among the various solid waste streams would have a less significant impact on emission source terms.

The second assumption is that at the time of waste generation, total activity concentrations in LLMW streams are the same as in LLW streams. (The actual LLMW activities were then derived by "aging" the radionuclides in the LLW.) It is reasonable to assume that at the time of generation, the LLMW streams were similar to LLW streams in

radionuclide composition because, typically, the same nuclear processes generated the radionuclides that are present in both streams. Because the actual relationship between the initial activity concentrations in LLMW and LLW is not known, this assumption introduces a quantitative (potentially significant) uncertainty to the total radioactivity in the emission source terms. However, the impact of the assumption of identical initial activity levels for LLW and LLMW when applied to comparisons among the different WM alternatives would be less significant because the errors in total activity concentration estimates would tend to be in the same direction for all alternatives.

Other assumptions pertain to the age of the LLMW at the time of treatment, values assumed for TRUW content, and Tc-99 content of wastes from gaseous diffusion plants. Uncertainties introduced by these assumptions are expected to be of lesser importance than those arising from the other two assumptions discussed.

The assumptions made in developing hazardous chemical profiles are associated with much greater uncertainties than the assumptions for radiological profiles. Databases provide very limited information on the chemical characteristics of LLMW. Only about 5 to 10% of the more than 2,000 waste streams in MWIR-2 contain quantitative data on chemical composition. Typically, information in MWIR-2 identifies only the types of chemicals in the waste streams but does not provide chemical concentrations. No chemical content information at all is available for about 5% of the waste streams.

Because of the paucity of quantitative data and to allow for comparison of chemical risks across sites and WM alternatives, the chemical profiles developed for the WM PEIS were assumed to contain only 16 hazardous chemicals and/or groups of chemicals (even though over 100 individual chemical species are identified in the MWIR-2 database). It was also assumed that the chemical profiles for the LLMW are independent of the site that generates the waste and depend only on the waste treatment codes (the converse assumption to that applied for radiological profiles). Both of these assumptions may lead to large uncertainties in chemical profiles.

Limiting the chemical profiles to 16 hazardous chemicals may overlook an important chemical contaminant that appears only in minute quantities in the database but may be present in large quantities in a poorly characterized waste stream. Such an oversight can lead to significant errors in estimating chemical emission source terms.

The assumption that chemical profiles are independent of the generating site is made only because insufficient data are available to develop site-specific profiles. It is expected that true chemical profiles vary from site to site. This assumption is expected to introduce large uncertainties in the source term estimates and in the comparisons between WM alternatives.

Additional uncertainties arise from the meager quantitative chemical characterization data for LLMW. Large errors may be introduced by assuming that the chemical concentrations available for 5 to 10% of the waste streams are representative of all waste streams.

7.2 MODEL UNCERTAINTIES

Two models were used in the calculations of volume, composition, and processing of LLMW: (1) the Consolidated Waste Management Flowchart of the Mixed Waste Treatment Project and (2) the WM PEIS LLMW computational model for volume throughputs, species fractionation, and emissions. Each model has assumptions that can introduce uncertainty into the model output data.

7.2.1 Uncertainties in the Consolidated Waste Management Flowchart

Significant uncertainty is introduced into the estimation of contaminant emissions and waste flow through the proposed LLMW management system because the Consolidated Waste Management Flowchart model (Musgrave 1994) was initially developed to follow waste volume, rather than waste mass, through various treatment modules. The flowchart provided volume branch splits to track the volume throughput of LLMW through the model. However, to estimate emissions of radionuclides and hazardous chemicals and to quantify the flow of contaminants through all modules in the treatment train, the model requires that waste and contaminant throughput masses be known. To enable the Consolidated Waste Management Flowchart to track mass throughput, assumptions were made about the densities of waste streams processed through the various modules.

Ideally, if material densities were known at each step in the process, the mass-based approach and the volume-based approach would be equivalent. However, because the densities were not known for each step in the process, estimated densities were applied to each input/output volume to obtain waste and contaminant masses. The estimates were based on the limited data available in MWIR-2, the general literature, and best engineering judgment, but because they are estimates, they add uncertainty to the mass conversions actually used in running the computational model. A model based directly on contaminant input masses would enable much more accurate contaminant tracking because (1) treatment facilities generally operate according to mass loading, (2) treatment chemistry is calculated with respect to mass, and (3) the mass-based model is independent of waste characteristics such as density, temperature, and pressure.

7.2.2 Uncertainties in the Computational Model

Uncertainties also arise from the assumptions used in the computational model to trace changes in waste stream composition as the waste stream moves through the treatment train. A number of assumptions have been made in the development of the model. This section discusses uncertainties introduced through the operational parameters of the model.

Two model parameters, the contaminant fractionation and the volume branch split, probably account for the greatest uncertainties in the model. The contaminant fractionation parameter orders the flow of contaminants through the entire treatment train process. It depends upon both the treatment technology and the physical and chemical properties of each

contaminant, and it is assumed to be independent of the waste stream. (Contaminant fractionation values are given in Tables A.2 and A.3 of the Appendix.)

The assumption that the contaminant fractionation for a given technology is independent of the type of waste stream is likely to introduce significant uncertainties to the computational model's output. For example, in the incineration of two different waste streams (e.g., organic liquids with few particulates and organically contaminated sludges with many particulates), the fractionation of a typical radionuclide (e.g., Sr-90) into the air emissions could vary substantially with each waste type. However, the model assumes the same fractionation factor for the contaminant in the incinerator, regardless of the input waste type. The only justification for this assumption is the lack of appropriate data to allow different fractionation parameters.

A second type of uncertainty arises when considering the volume branch splits at each treatment facility. The volume branch splits at each treatment module, when combined with the specific waste density, determine the mass flow of waste through the entire treatment train and were derived from general engineering assumptions made after assessment of each treatment technology and the physical and chemical characteristics of the incoming waste. Volume branch splits (see Figures A.1 through A.22) are independent of the chemical contaminant concentration. Since each treatment category is actually composed of a variety of different wastes (many with substantially different densities), a more accurate characterization of a waste passing through a treatment technology would be based on mass balance of the waste and contaminants (see discussion in Section 7.2.1). Uncertainties may be propagated using a volume split approach, especially when incoming waste is actually composed of different kinds of waste accumulated together.

Simplifications made in the proposed treatment system (Figure 1.1) can also lead to systematic errors in the model's results. Many of the secondary waste streams, such as water discharge from particular treatment facilities, have not been included in the analysis. For example, the water discharge stream from the off-gas system on the incinerator (box 490, Figure 1.1) is not calculated in the model. In practice, this line would recycle wastewater to the aqueous treatment system (box 150, Figure 1.1). As the model currently describes, H-3 entering the incinerator system is discharged to the stack as a contaminant in the air emission. Connection of the water recycle line in off-gas treatment (as likely would be done in actual facility use) would ultimately lead to much of this H-3 reaching the water discharge at the termination of the aqueous treatment system. In addition, uncertainties in the model could couple synergistically with uncertainties from other assumptions, multiplying the overall uncertainty. In the particular example of H-3, a problem discussed in Section 7.1.2 concerning the overestimation of a substance such as H-3 in solids could couple with the water recycle problem discussed here. In this case, the ratio of H-3 released to the air versus water could be very uncertain.

This analysis has used the representative treatment technologies discussed in the WM PEIS. Any substitution of different treatment technologies other than those technologies currently used in the computational model could substantially alter the results of this

analysis. Similarly, it is not clear how sensitive the model results are to changes in the operating parameters of a treatment facility. An example of this type of uncertainty includes adjustment of incinerator operational conditions to burn PCB waste. This change could easily affect the modeled output results for other types of contaminants.

7.3 SUMMARY

The modeled output data from the computational model represent only estimates of contaminant emissions and waste throughput. The results are dependent upon the accuracy of the initial input data, much of which were developed using informed engineering and scientific assumptions to fill in the substantial gaps that exist in the LLMW database. The uncertainties lie most importantly with the incomplete database, rather than with the use of an analytical tool such as the computational model. As the database becomes more refined with regard to the composition and volume estimates of input LLMW and as the treatment process becomes more technically developed, future model data estimations should improve in both precision and accuracy.

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APPENDIX:

COMPUTATIONAL MODEL DATA

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COMPUTATIONAL MODEL DATA

A.1 VOLUMES AND DENSITIES FOR THE COMPUTATIONAL MODEL

The 32 generic waste treatment codes for the 2,000+ individual waste management (WM) low-level mixed waste (LLMW) streams are listed in Table 1.1. The computational model tracks the mass flow for the 23 types of LLMW that comprise the bulk of the WM LLMW. The remaining nine waste codes represent wastes that either are very minor in terms of waste volume or require specialized treatment outside the scope of the treatment complex for the Mixed Waste Treatment Project. The model follows, for each of the 23 treatment codes, the mass flow of the input waste by requiring a mass balance between the input waste stream to a treatment module and the various primary and secondary output waste streams for that module. The mass flow is followed from module to module until the waste is prepared for disposal. The mass balance computation uses data on the volume and density of the waste at each module for each of the 23 waste stream treatment codes. The volume percentages of waste out of each module for all modules needed in the treatment of the particular waste are shown in Figures A.1 through A.22; the numbers listed in parentheses are the densities (in kg/m^3) for the waste at that treatment step.

A.2 RADIOLOGICAL PROFILES FOR LLMW AT EACH OF THE MAJOR SITES

The relative activity (fraction of total activity) of each radionuclide and its activity concentration (Ci/m^3) are given in Table A.1 for each of the major sites. The radiological profiles for both contact-handled (CH) non-alpha LLMW and CH alpha LLMW (where appropriate) are shown.

A.3 CHEMICAL AND RADIOLOGICAL FRACTIONATION

The computational model predicts the partitioning of chemical and radiological contaminants in each treatment module on the basis of the characteristics of the waste matrix, the chemical and physical properties of specific contaminants, and the chemical reactions occurring at each treatment facility. At each module, the input waste stream contaminants are fractioned into residuals (air release, water release, and/or by-product solids) and product, the output waste stream. For most modules, the contaminant residual and product fractions would sum to 1.0 (100%) of the input waste stream. For modules that actually destroy contaminants (e.g., incinerator destruction of organic chemicals), the 1.0 sum would also include the contaminant destruction fraction.

In Table A.2, partitioning factors for chemical contaminants in LLMW technologies are summarized by treatment code. In Table A.3, radiological release fractions for LLMW technologies are summarized by treatment code. These data were combined with the volume

fractions and waste stream densities from Figures A.1 through A.22 to estimate the LLMW treatment emissions (Tables A.4 through A.23) and contaminant concentrations in disposed solids (Tables A.24 through A.28).

A.4 LLMW TREATMENT EMISSIONS

The calculated air and water emissions of radionuclide and hazardous chemical constituents from treatment sites are presented in Tables A.4 through A.23. The individual treatment module air emissions as estimated by the LLMW computational model were summed to obtain air emissions for each site. Emissions are shown for the 16 major hazardous chemicals and chemical classes delineated in the LLMW chemical profiles in Section 2.3 of this report (19 chemicals for polychlorinated biphenyl [PCB] wastes). Radioactive emissions are represented by the 24 radionuclides that account for over 99% of the total activity in LLMW. Emissions are given for all treatment alternatives for all non-alpha LLMW. Emissions for alpha LLMW and from the treatment of PCB-contaminated LLMW are given only for Cases 2a and 17.* (The emissions from facilities that treat PCB-contaminated WM LLMW include three additional classes of hazardous chemicals: PCBs (as unspecified aroclors), dioxins, and furans. In the treatment of PCB wastes at the incinerator, it has been assumed that operating conditions of the incinerator could be adjusted to achieve 0.999999 destruction of PCBs and other toxic organic substances contained within the wastes.) Water emissions at each site represent releases from the aqueous treatment module. Air and water emissions under Case 17 for sites other than Hanford are from waste packaging and aqueous waste treatment modules only.

Tables A.4 through A.17 show air and water contaminant emissions for CH LLMW; Tables A.18 and A.19 show the emissions for RH LLMW; Tables A.20 through A.23 show emissions from the treatment of PCB-contaminated CH LLMW.

A.5 CONTAMINANT CONCENTRATIONS IN DISPOSED SOLIDS

In the U.S. Department of Energy's *Office of Waste Management Programmatic Environmental Impact Statement* (WM PEIS), treatment of LLMW leads to one of three stabilized solids that require final disposal: cement grout, polymer grout, and stabilized mercury solid. The concentrations of hazardous chemical constituents and radionuclides in solids sent for final disposal under each alternative are given in Tables A.24 through A.28 for CH non-alpha LLMW at each disposal site.

A.6 WASTE VOLUME REDUCTIONS

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* Air and water emissions for all additional case options of alpha LLMW and PCB-contaminated LLMW, as well as the No Action Alternative for LLMW, are available upon request from the Environmental Assessment Division, Special Projects and Project Planning Department, Argonne National Laboratory.

Each of the waste stream codes (1 to 23) would be expected to undergo some amount of volume reduction (or enhancement) upon treatment. Table A.29 lists the results of this analysis for each waste code for a particular alternative (4 sites treat and 6 sites dispose, Case 15 for CH non-alpha). This table also gives the gross waste input volume and the percentage of the different types of grout that result from treatment for each waste category. Note that the volume reduction factors listed in the table for each waste type, are based on gross volumes. This takes into account the large variation in the gross input densities for each waste type, as determined from actual drums of waste. The variation in the volume reduction factor ranges from 0.064 (waste code 11) to 1.022 (waste code 5).

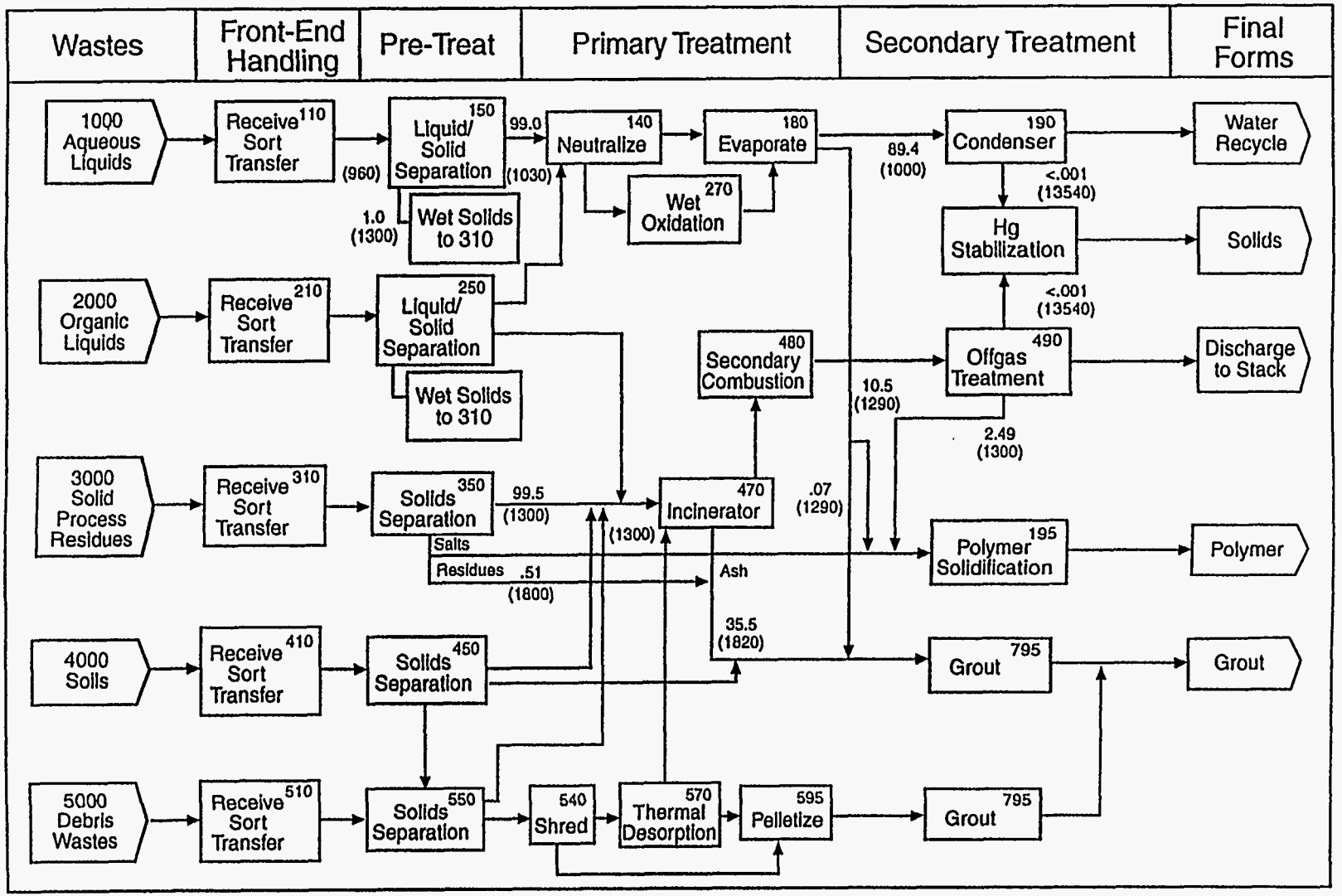

FIGURE A.1 WM PEIS LLMW Waste Management Flowchart for Treatment Code 1

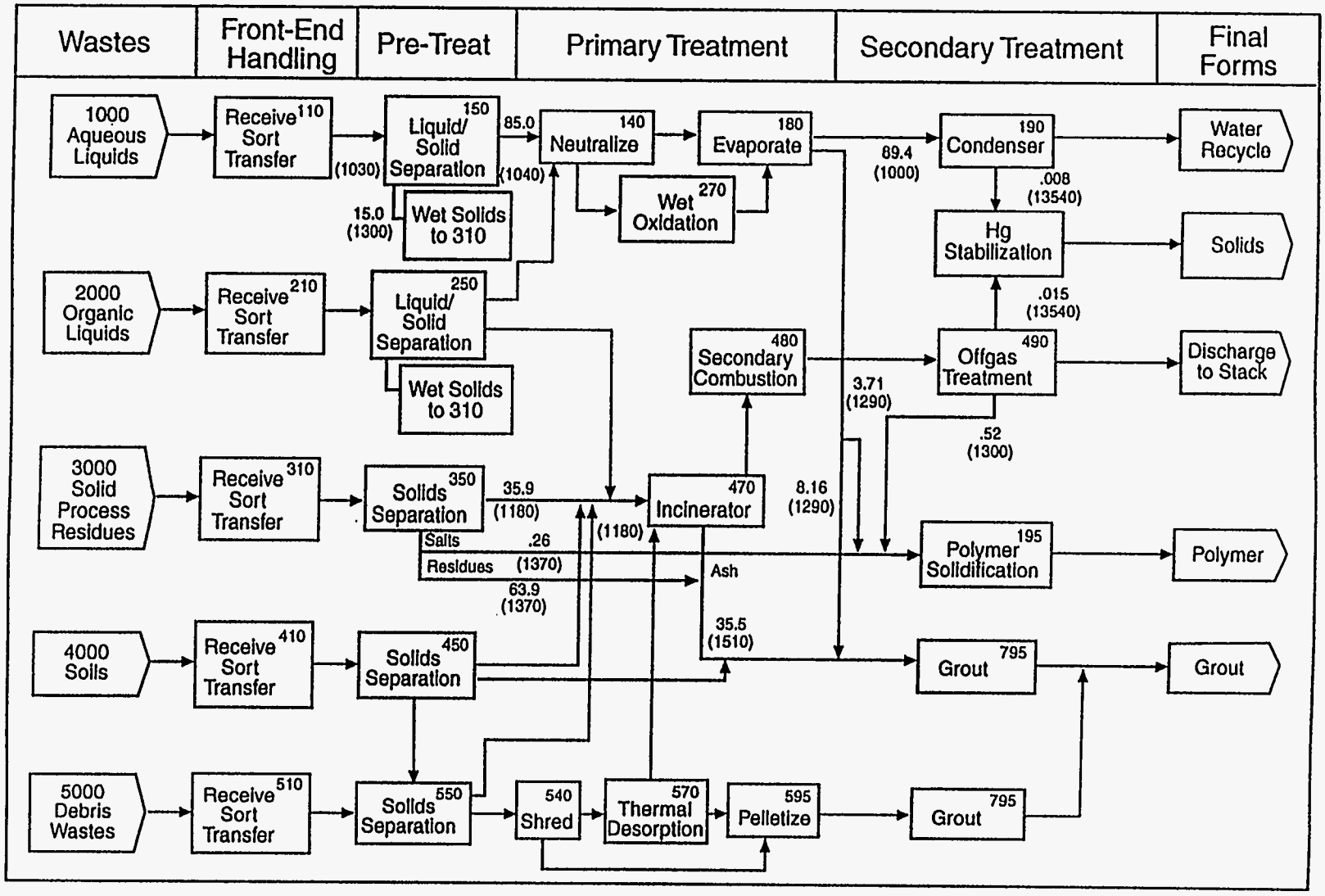

FIGURE A.2 WM PEIS LLMW Waste Management Flowchart for Treatment Code 2

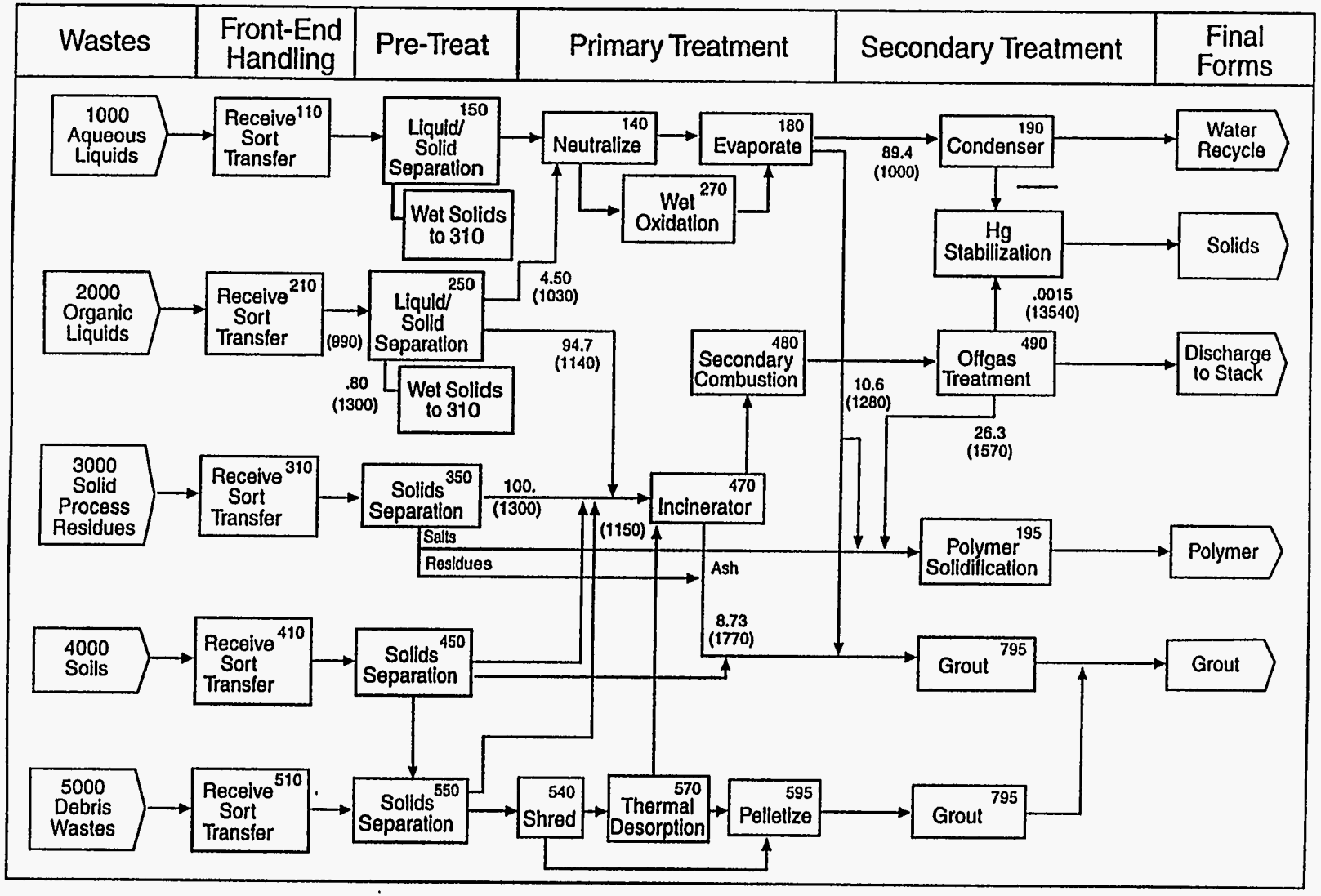

FIGURE A.3 WM PEIS LLMW Waste Management Flowchart for Treatment Code 3

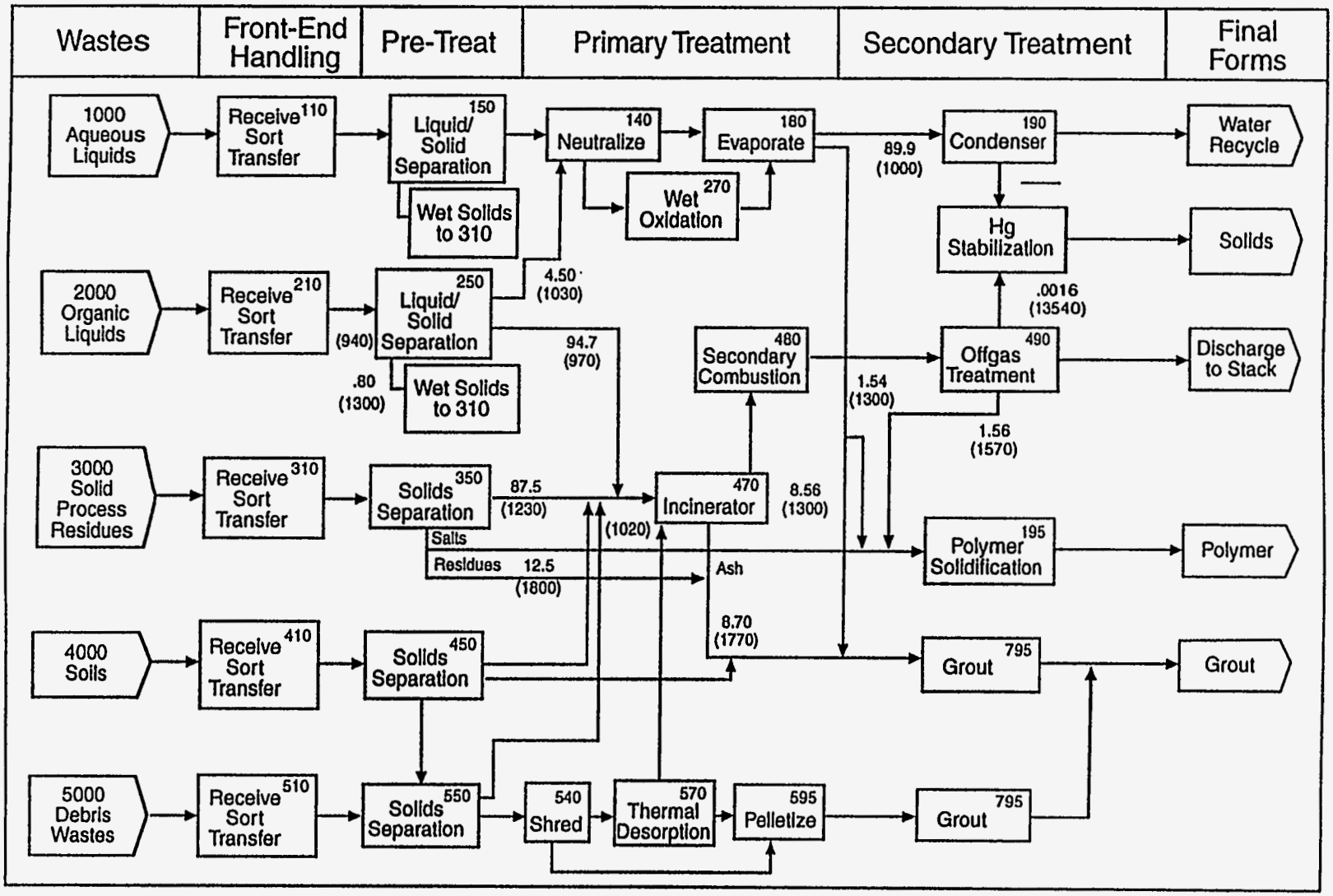

FIGURE A.4 WM PEIS LLMW Waste Management Flowchart for Treatment Code 4

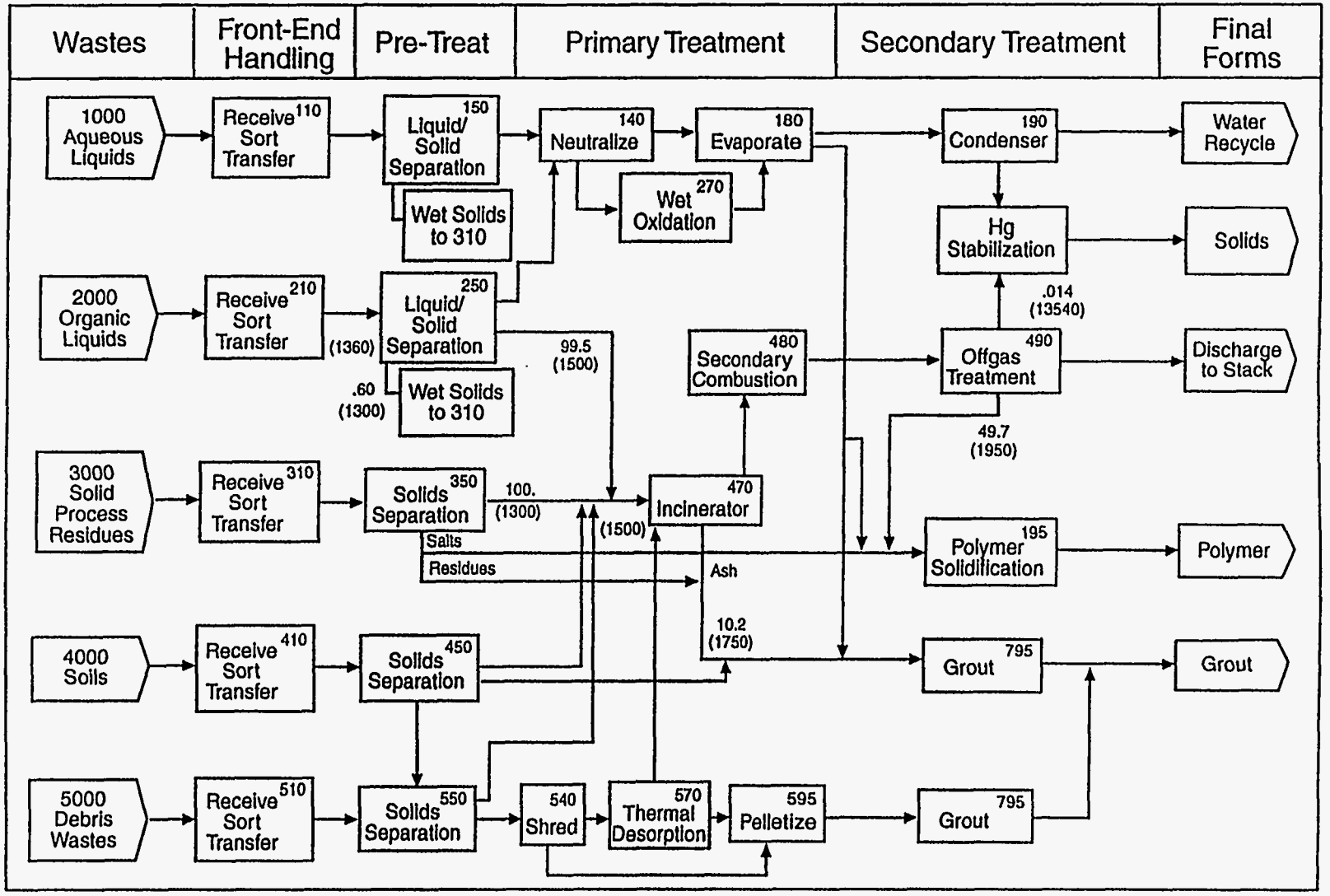

FIGURE A.5 WM PEIS LLMW Waste Management Flowchart for Treatment Code 5

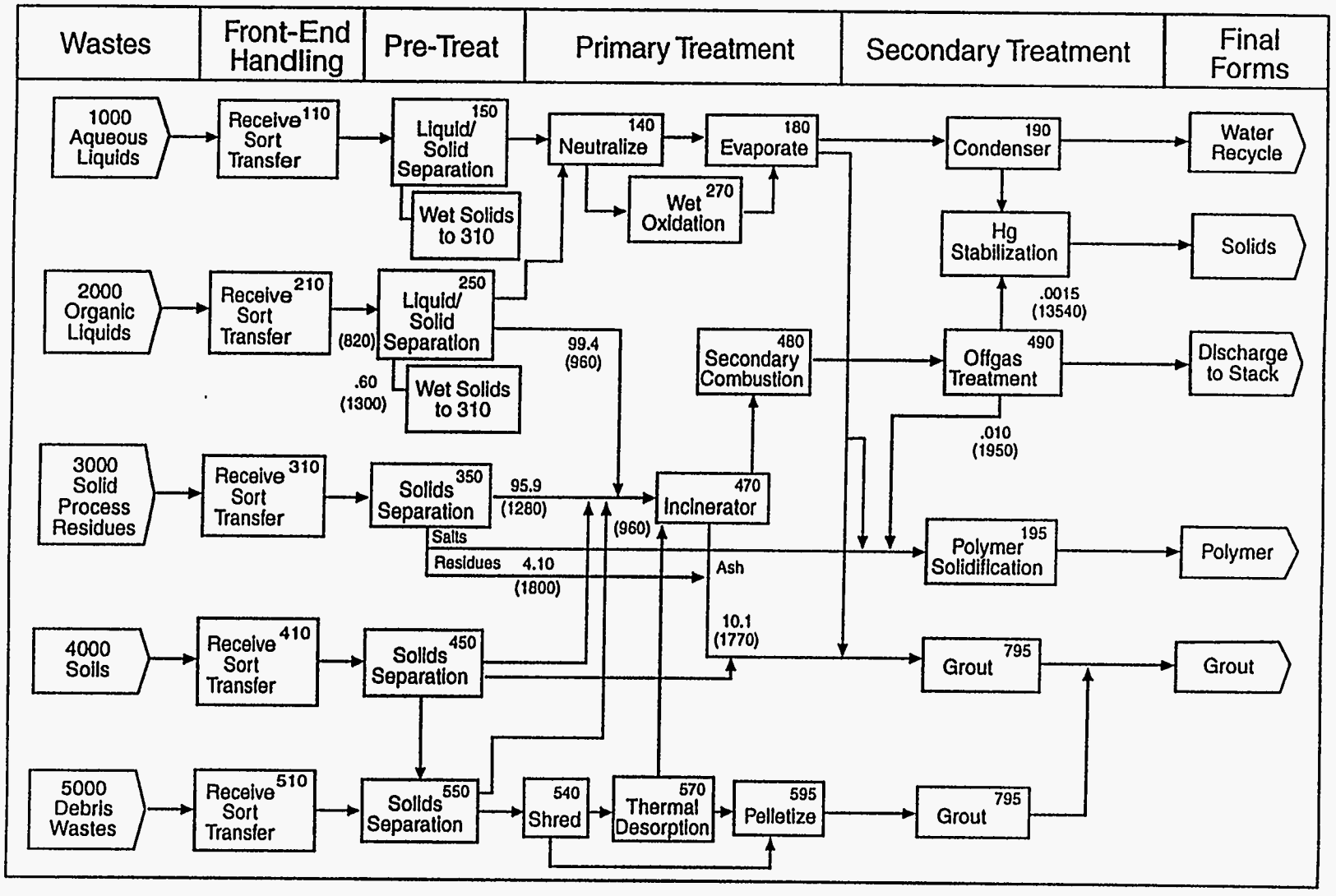

FIGURE A.6 WM PEIS LLMW Waste Management Flowchart for Treatment Code 6

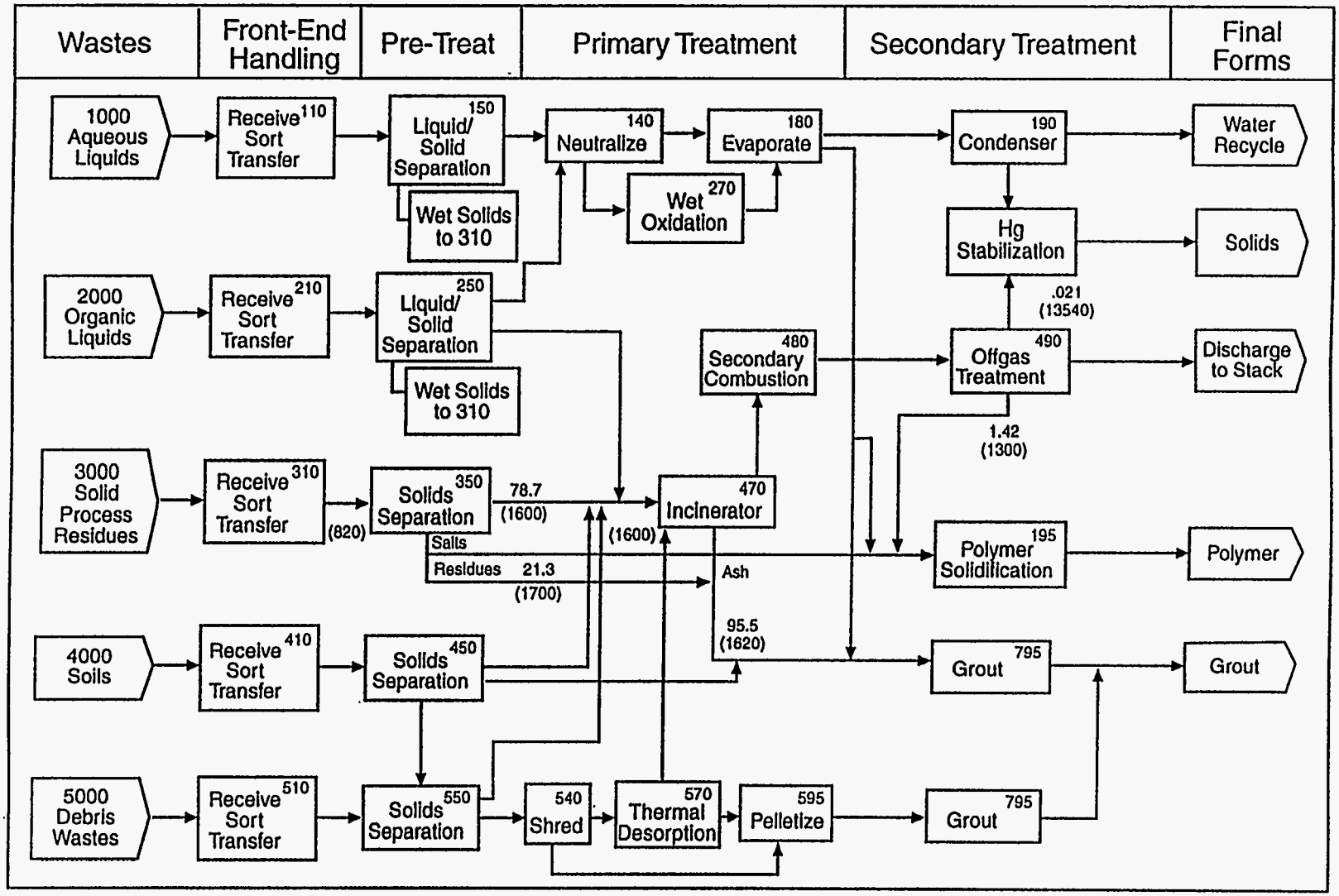

FIGURE A.7 WM PEIS LLMW Waste Management Flowchart for Treatment Code 7

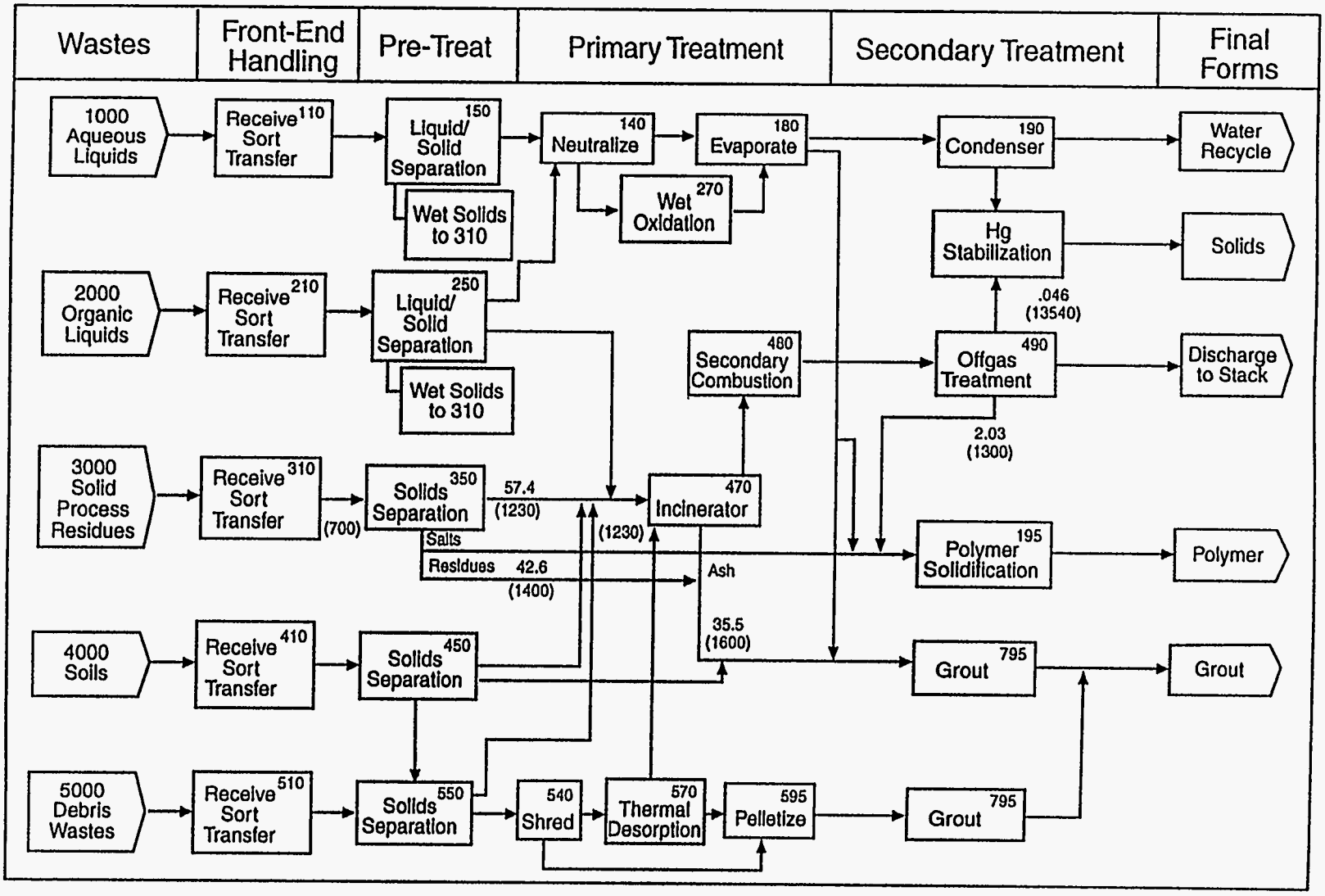

FIGURE A.8 WM PEIS LLMW Waste Management Flowchart for Treatment Code 8

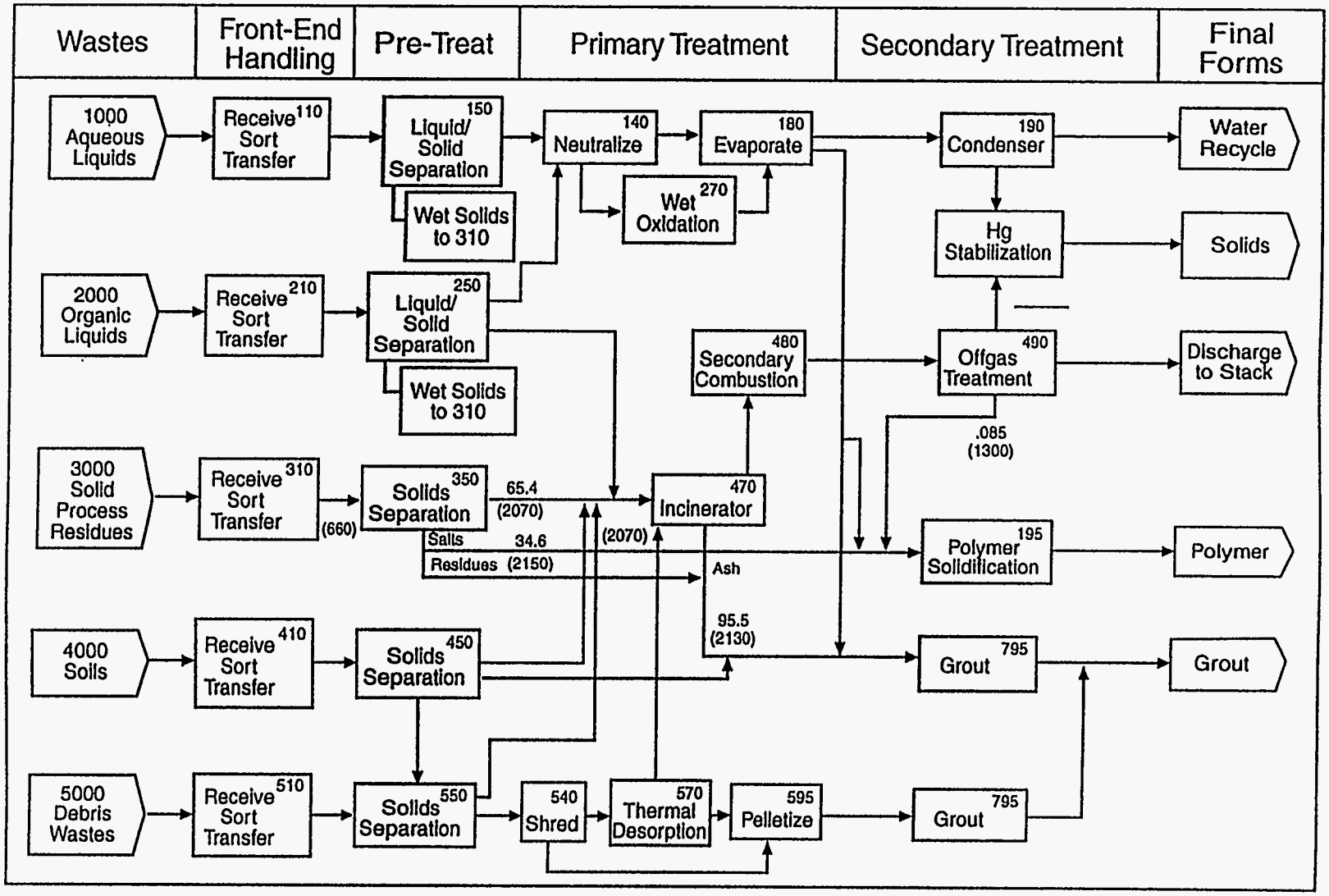

FIGURE A.9 WM PEIS LLMW Waste Management Flowchart for Treatment Code 9

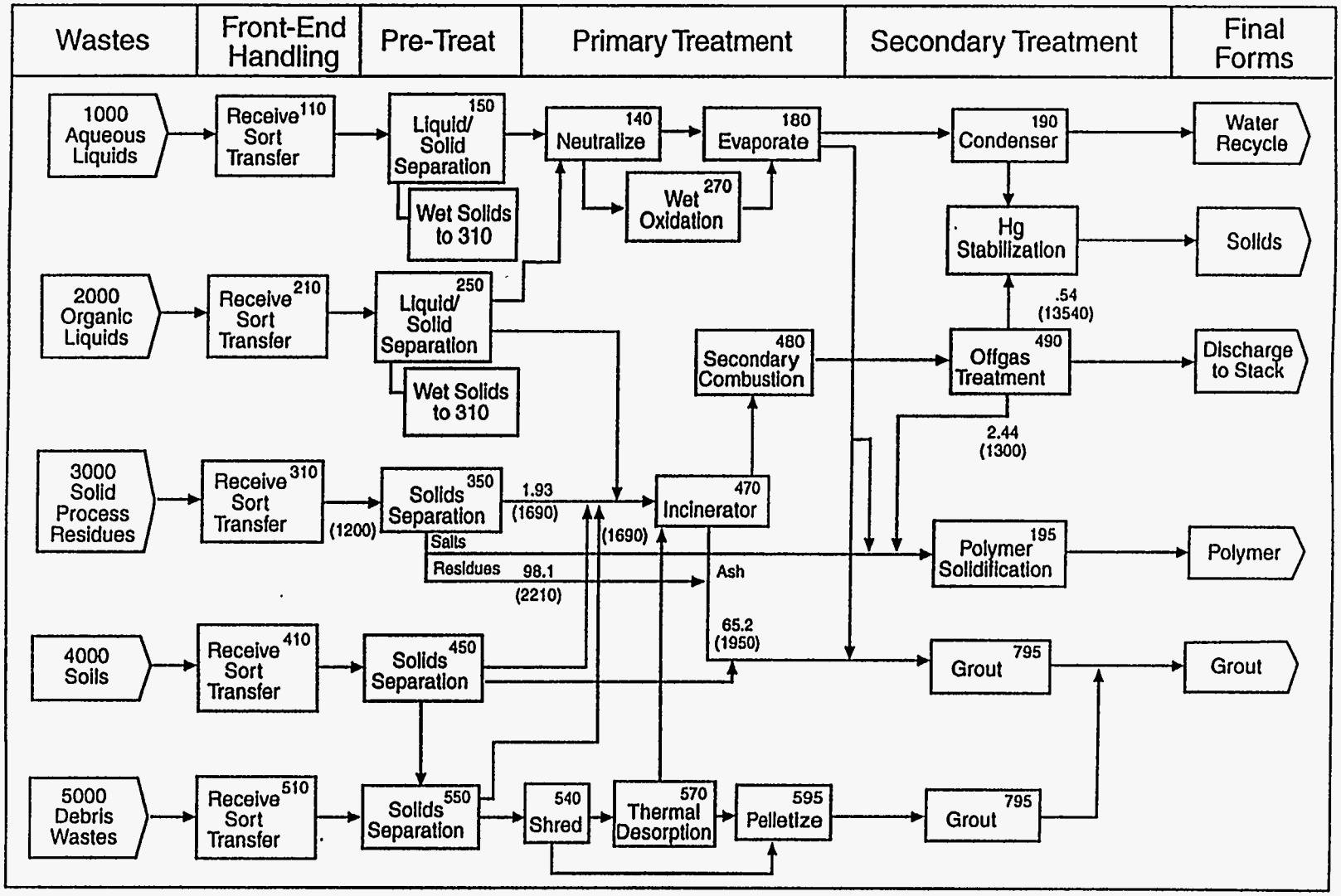

FIGURE A.10 WM PEIS LLMW Waste Management Flowchart for Treatment Code 10

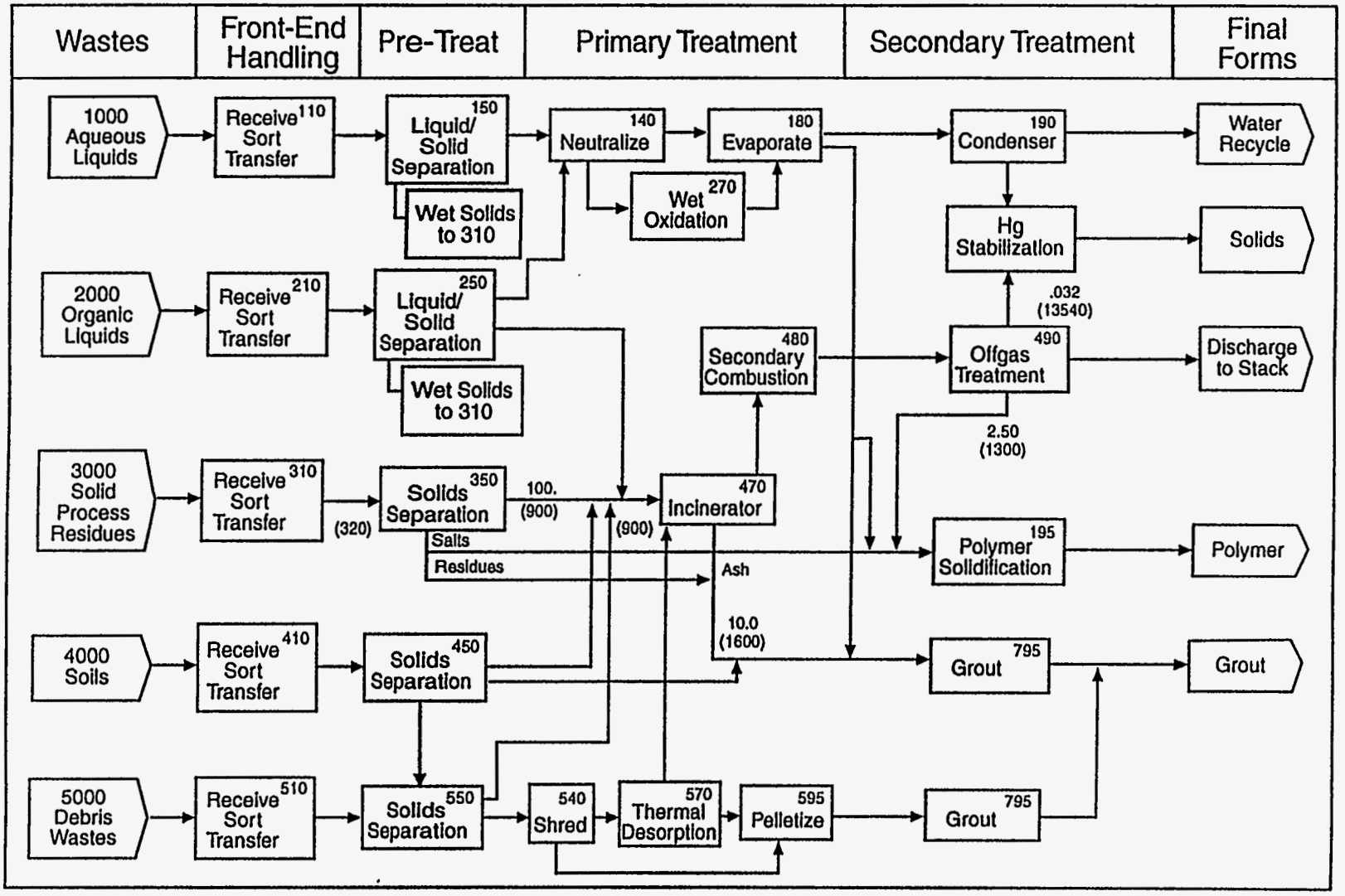

FIGURE A.11 WM PEIS LLMW Waste Management Flowchart for Treatment Code 11

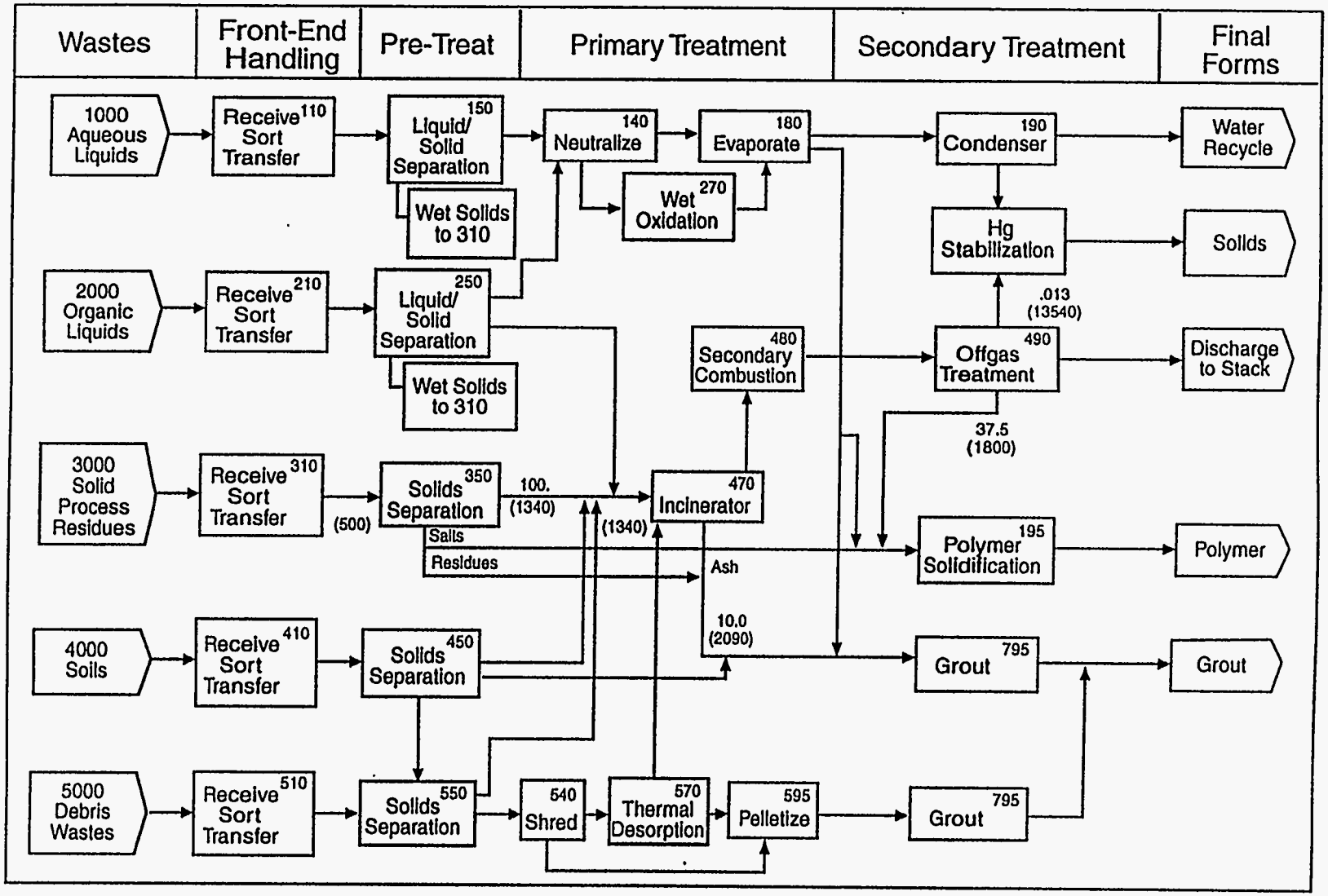

FIGURE A.12 WM PEIS LLMW Waste Management Flowchart for Treatment Code 12

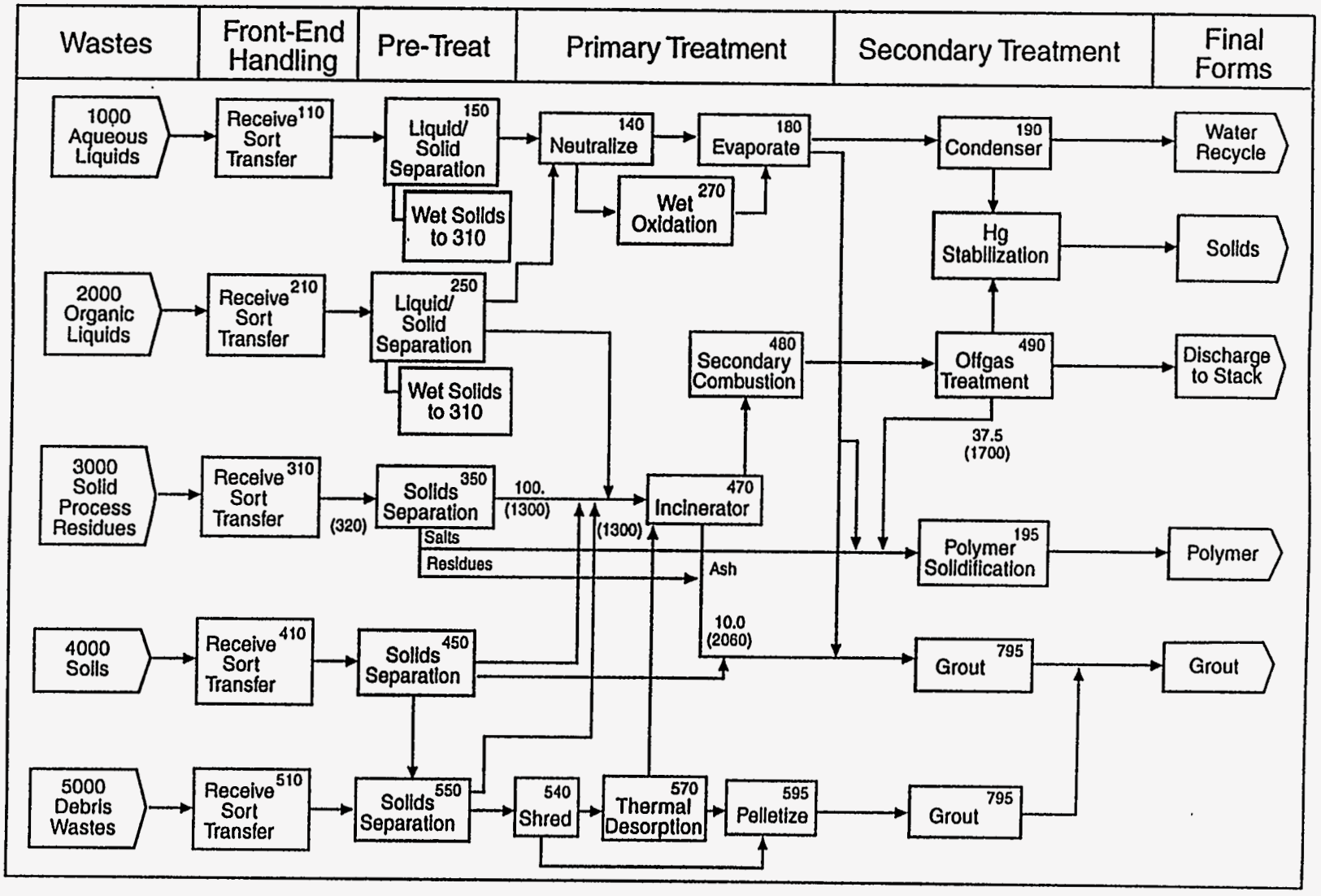

FIGURE A.13 WM PEIS LLMW Waste Management Flowchart for Treatment Codes 13 and 14

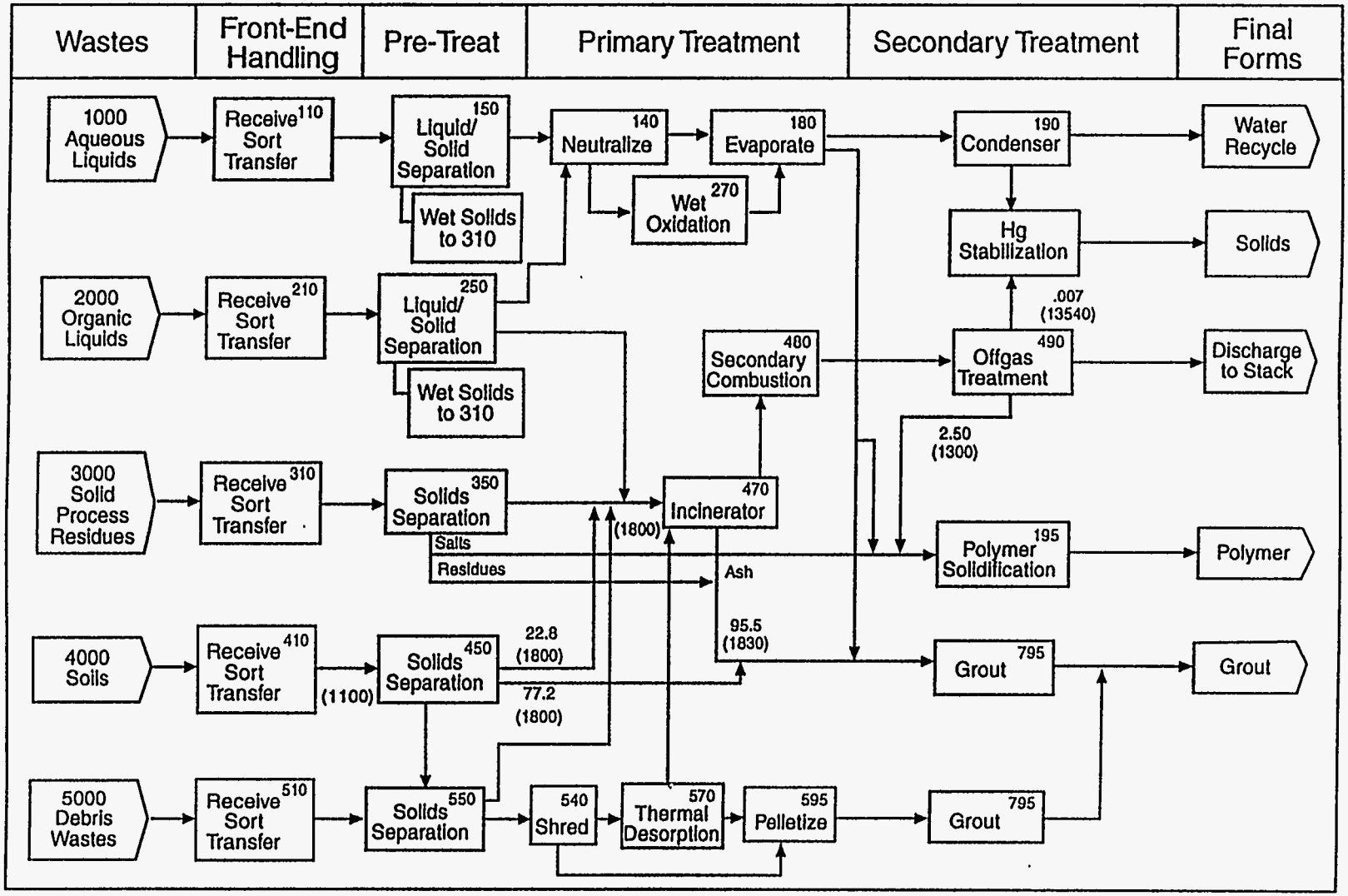

FIGURE A.14 WM PEIS LLMW Waste Management Flowchart for Treatment Code 15

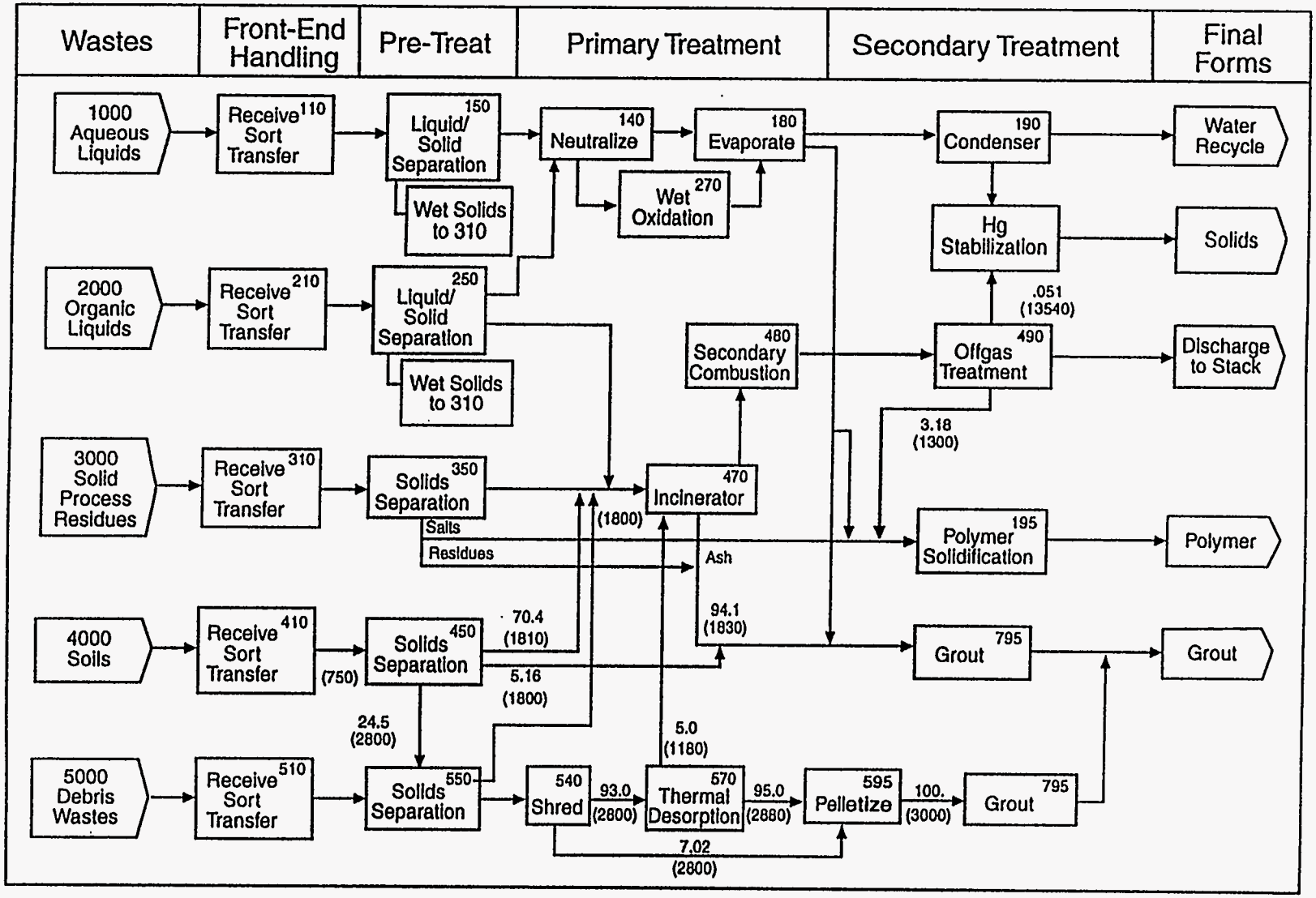

FIGURE A.15 WM PEIS LLMW Waste Management Flowchart for Treatment Code 16

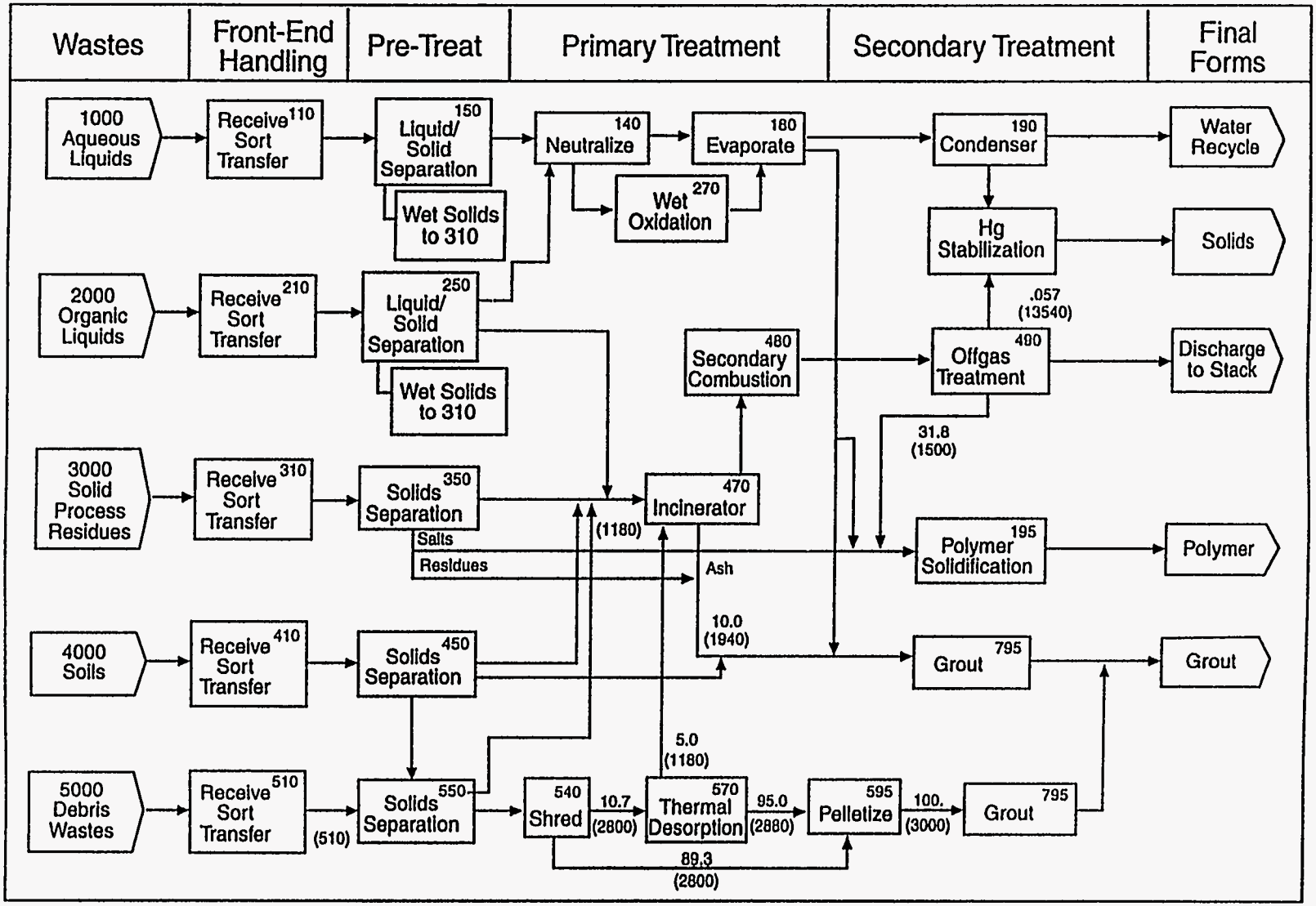

FIGURE A.16 WM PEIS LLMW Waste Management Flowchart for Treatment Code 17

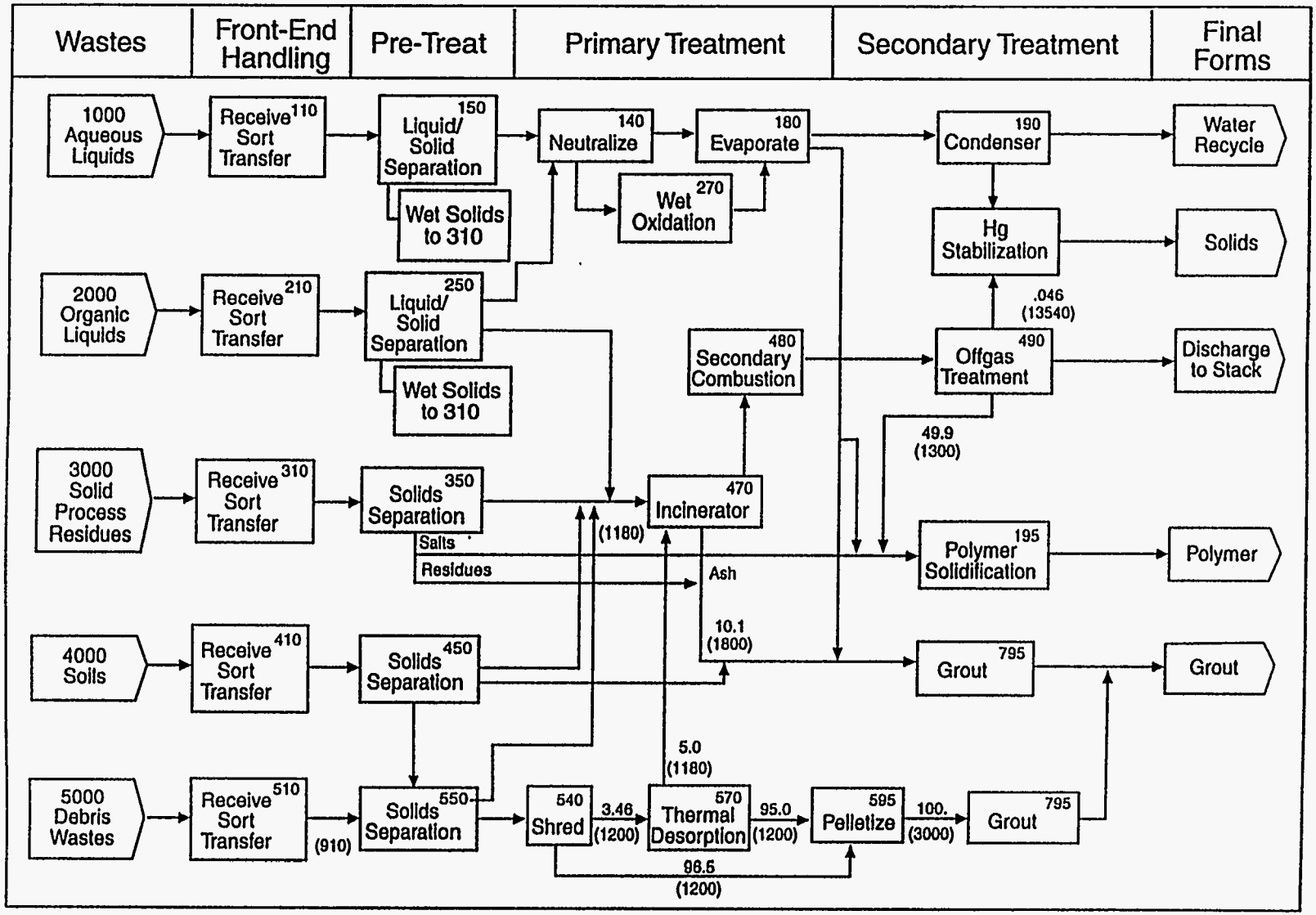

FIGURE A.17 WM PEIS LLMW Waste Management Flowchart for Treatment Code 18

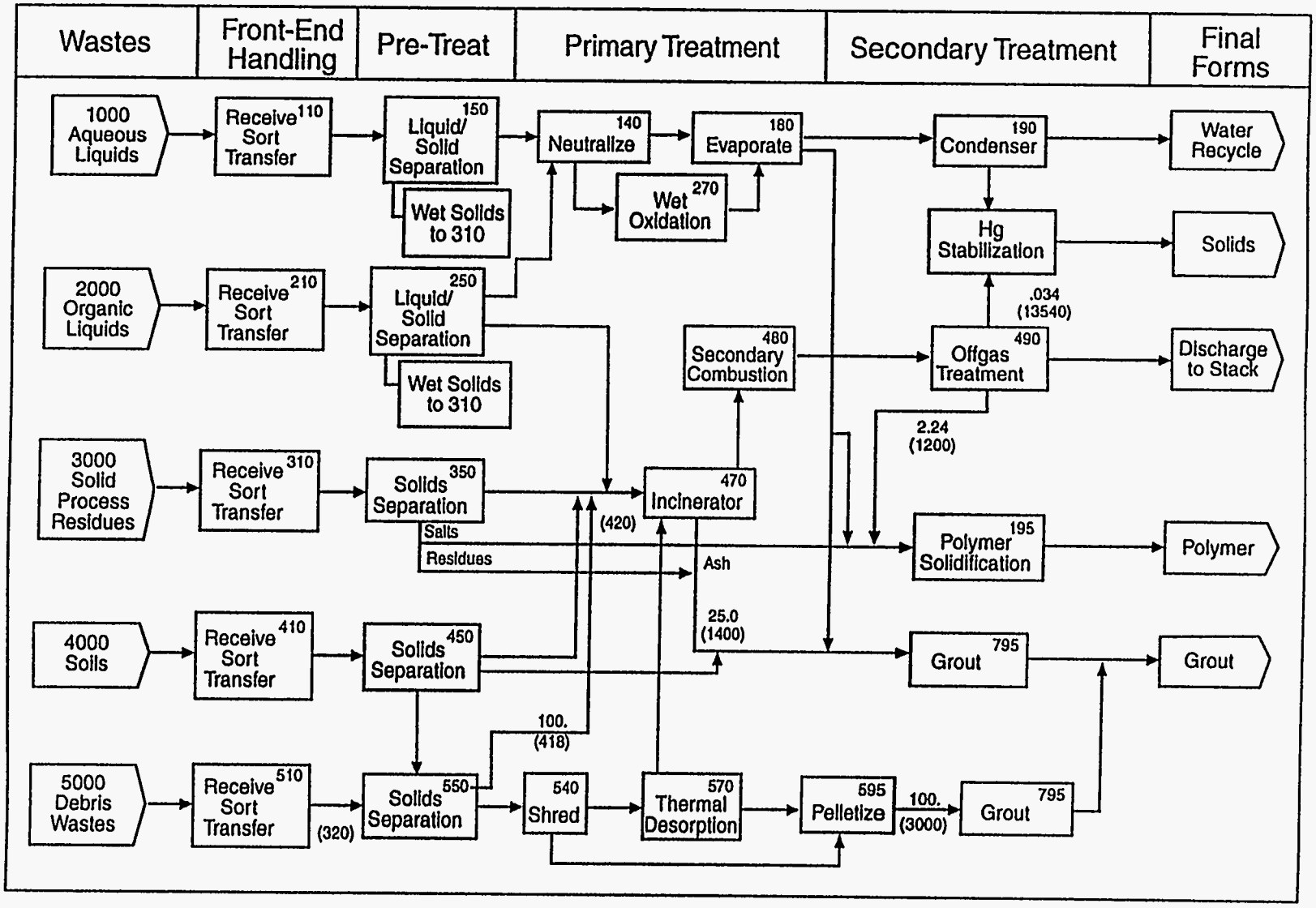

FIGURE A.18 WM PEIS LLMW Waste Management Flowchart for Treatment Code 19

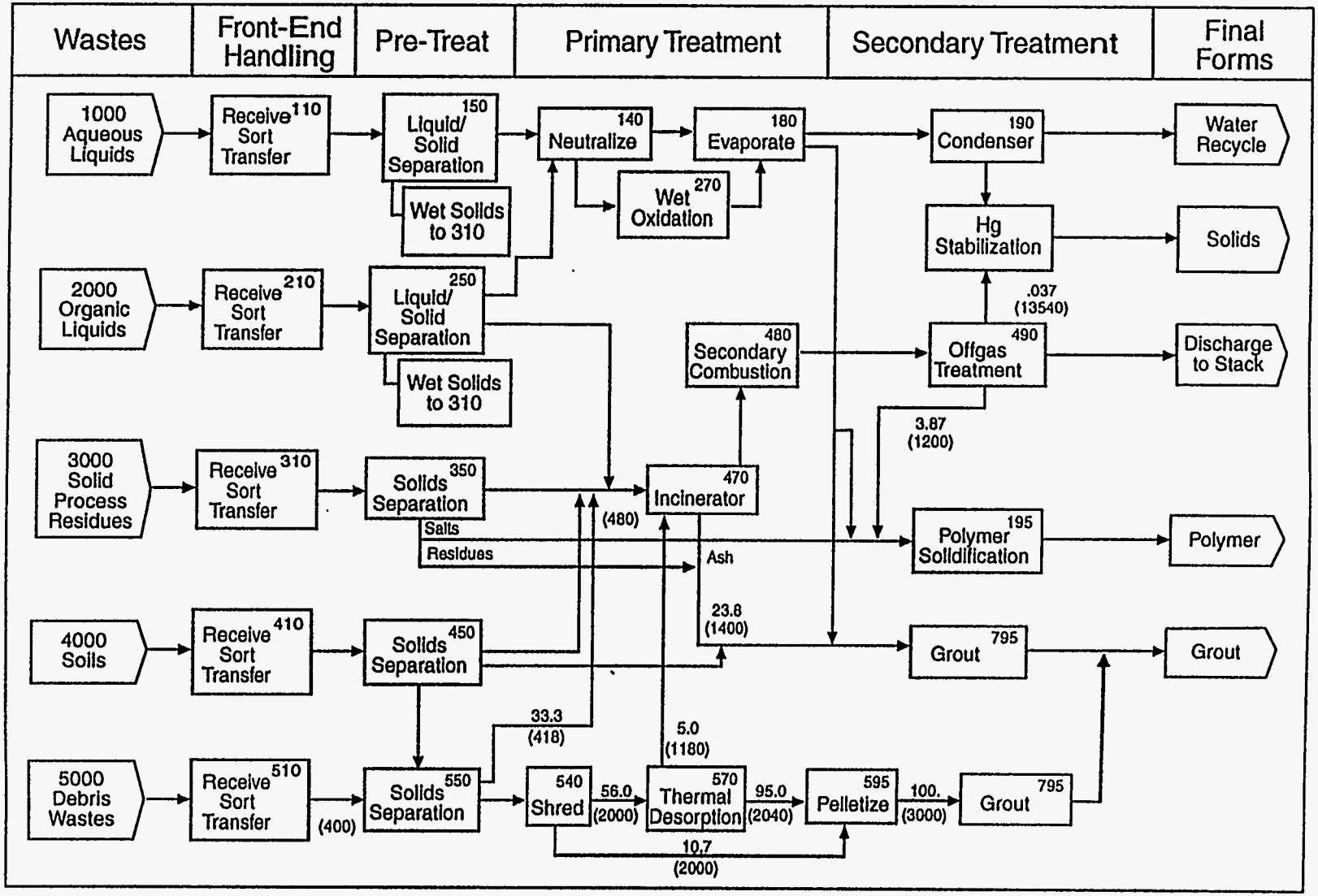

FIGURE A.19 WM PEIS LLMW Waste Management Flowchart for Treatment Code 20

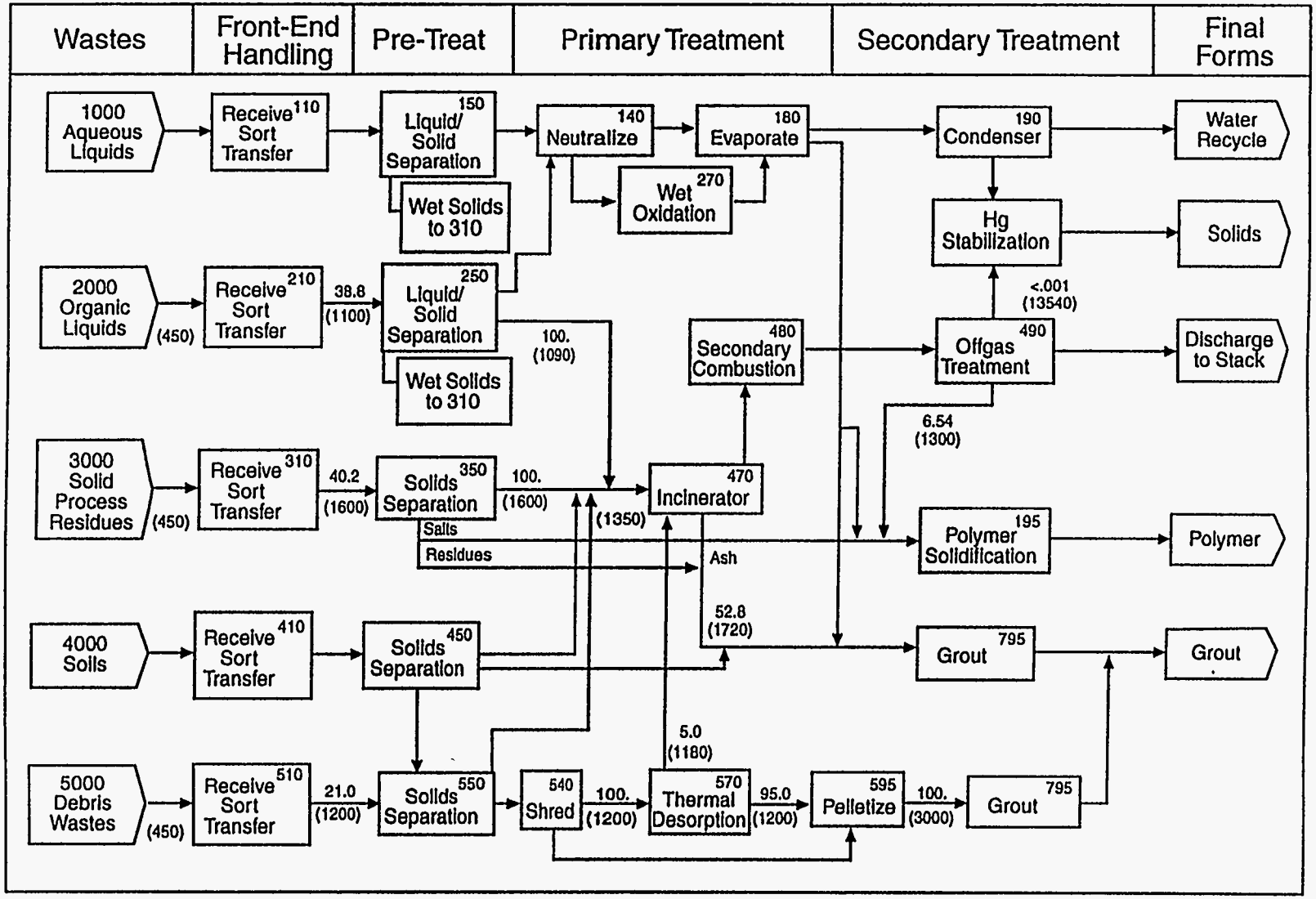

FIGURE A.20 WM PEIS LLMW Waste Management Flowchart for Treatment Code 21

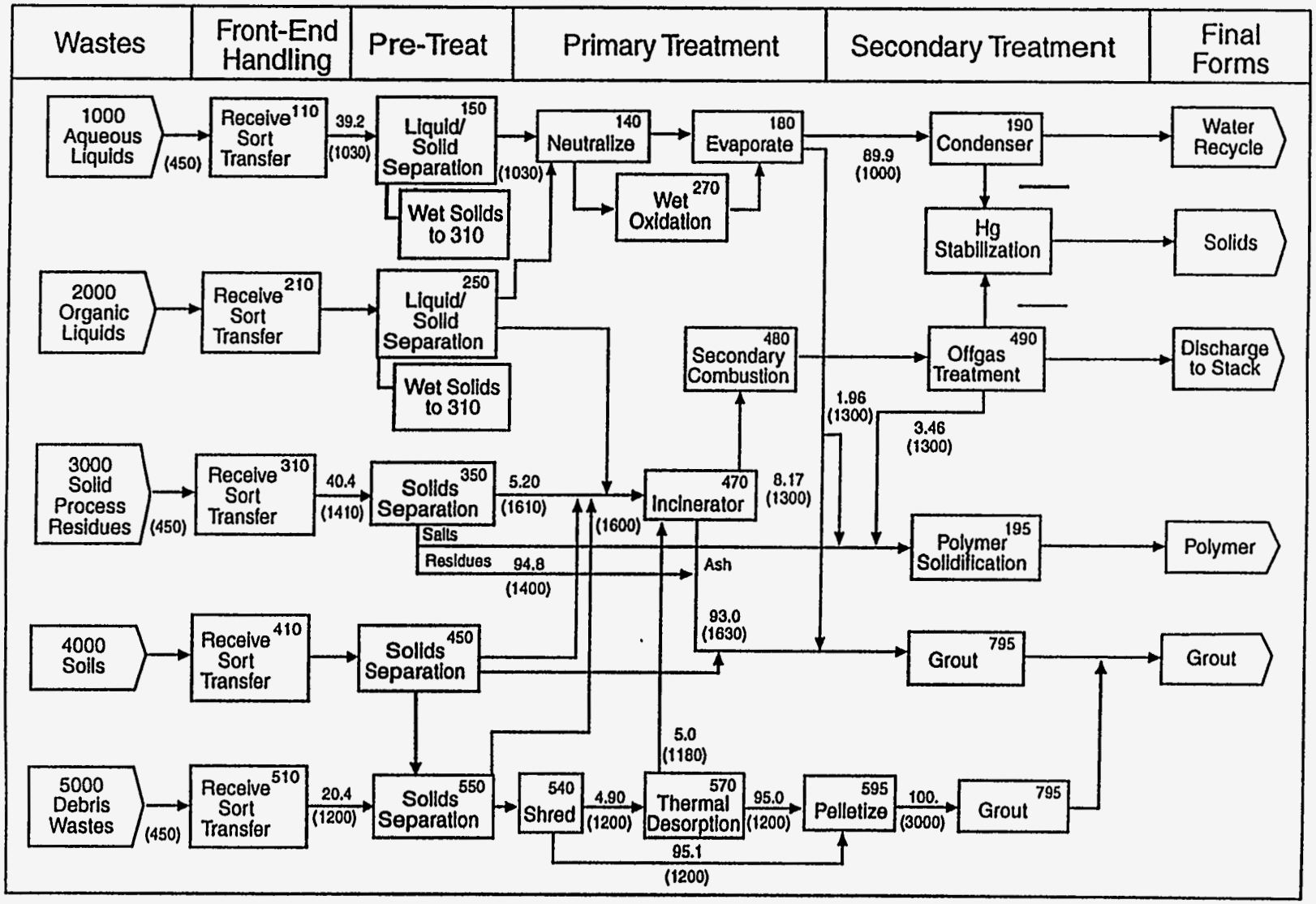

FIGURE A.21 WM PEIS LLMW Waste Management Flowchart for Treatment Code 22

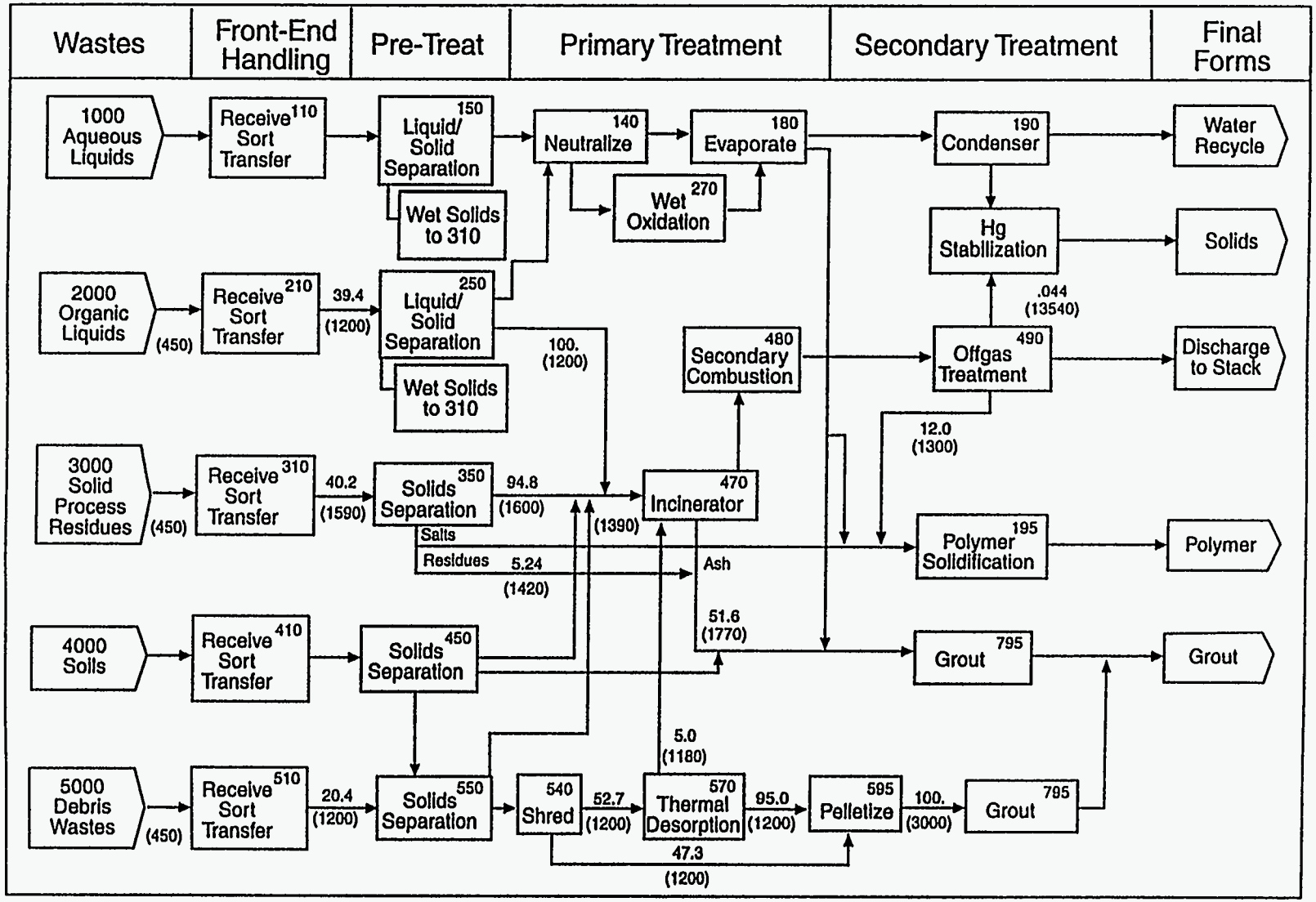

FIGURE A.22 WM PEIS LLMW Waste Management Flowchart for Treatment Code 23

TABLE A.1 WM PEIS LLMW Radionuclide Profile by Site

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
Fernald Environmental Management Project (FEMP)	Non-alpha	Tc-99	4.98E-03	3.98E-05
		Tl-208	1.70E-05	1.36E-07
		Pb-212	4.50E-05	3.60E-07
		Bi-212	4.50E-05	3.60E-07
		Po-212	2.90E-05	2.32E-07
		Po-216	4.50E-05	3.60E-07
		Ra-224	4.50E-05	3.60E-07
		Ra-228	2.68E-04	2.14E-06
		Ac-228	2.68E-04	2.14E-06
		Th-228	4.50E-05	3.60E-07
		Th-231	2.58E-04	2.06E-06
		Th-232	2.72E-03	2.17E-05
		Th-234	3.30E-01	2.64E-03
		Pa-234	3.40E-05	2.72E-07
		Pa-234m	3.30E-01	2.64E-03
		U-235	2.70E-04	2.06E-06
		U-238	3.30E-01	2.64E-03
Hanford	Non-alpha	H-3	1.84E-02	7.32E-02
		Co-60	3.10E-04	1.23E-03
		Ni-59	4.74E-04	1.89E-03
		Ni-63	4.87E-02	1.94E-01
		Sr-90	2.19E-01	8.72E-01
		Y-90	2.19E-01	8.72E-01
		Nb-94	2.10E-05	8.36E-05
		Tc-99	1.10E-04	4.38E-04
		Cs-137	2.46E-01	9.79E-01
		Ba-137m	2.30E-01	9.15E-01
		Sm-151	3.54E-03	1.41E-02
		Eu-154	3.70E-04	1.47E-03
		Th-234	1.36E-04	5.41E-04
		Pa-234m	1.36E-04	5.41E-04
		U-238	1.36E-04	5.41E-04
		Pu-238	1.10E-02	4.38E-02
		Pu-239	1.49E-04	5.93E-04
		Pu-240	8.50E-05	3.38E-04
		Pu-241	2.44E-03	9.71E-03
		Am-241	2.09E-04	8.32E-04

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
Hanford (cont.)	Alpha	H-3	1.82E−02	7.24E−02
		Co-60	3.07E−04	1.22E−03
		Ni-59	4.70E−04	1.87E−03
		Ni-63	4.83E−02	1.92E−01
		Sr-90	2.18E−01	8.69E−01
		Y-90	2.18E−01	8.69E−01
		Nb-94	2.10E−05	8.36E−05
		Tc-99	1.09E−04	4.34E−04
		Cs-137	2.45E−01	9.76E−01
		Ba-137m	2.29E−01	9.13E−01
		Sm-151	3.51E−03	1.40E−02
		Eu-154	3.66E−04	1.46E−03
		Th-234	1.35E−04	5.37E−04
		Pa-234m	1.35E−04	5.37E−04
		U-238	1.35E−04	5.37E−04
		Pu-238	1.14E−02	4.54E−02
		Pu-239	1.89E−04	7.52E−04
		Pu-240	8.40E−05	3.34E−04
		Pu-241	4.91E−03	1.95E−02
		Am-241	2.10E−04	8.36E−04
Idaho National Engineering Laboratory (INEL)	Non-alpha	H-3	8.23E−02	3.08E+00
		Mn-54	1.20E−04	4.49E−03
		Fe-55	3.78E−02	1.41E+00
		Co-60	2.89E−01	1.08E+01
		Ni-59	3.78E−03	1.41E−01
		Ni-63	5.08E−01	1.90E+01
		Sr-90	1.78E−02	6.66E−01
		Y-90	1.78E−02	6.66E−01
		Nb-94	1.80E−04	6.73E−03
		Sb-125	8.00E−04	2.99E−03
		Te-125m	2.00E−05	7.48E−04
		Cs-134	1.70E−04	6.36E−03
		Cs-137	1.89E−02	7.07E−01
		Ba-137m	1.79E−02	6.70E−01
		Pm-147	2.06E−03	7.70E−02
		Sm-151	1.60E−04	5.98E−03
		Eu-154	2.30E−04	8.60E−03
		Eu-155	1.10E−04	4.11E−03
		Th-234	7.10E−04	2.66E−02
		Pa-234m	7.10E−04	2.66E−02
		U-238	7.10E−04	2.66E−02
		Pu-238	5.90E−04	2.21E−02
		Pu-241	4.80E−04	1.79E−02
		H-3	2.53E−02	4.25E−01
		Co-60	6.28E−03	1.06E−01
		Ni-59	9.60E−03	1.61E−01

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
INEL (cont.)	Alpha	Ni-63	8.87E-01	1.48E+01
		Sr-90	1.68E-02	2.82E-01
		Y-90	1.68E-02	2.88E-01
		Nb-94	4.20E-04	7.06E-03
		Cs-137	1.86E-02	3.13E-01
		Ba-137m	1.76E-02	2.96E-01
		Sm-151	2.70E-04	4.54E-03
		Eu-154	3.00E-05	5.04E-03
		Th-234	1.59E-03	2.60E-02
		Pa-234m	1.59E-03	2.62E-02
		U-238	1.59E-03	2.62E-02
		Pu-238	9.30E-04	1.56E-02
		Pu-240	3.00E-04	5.04E-04
		Pu-241	8.00E-04	1.34E-02
		Am-241	2.00E-05	3.36E-04
Los Alamos National Laboratory (LANL)	Non-alpha	H-3	9.57E-01	2.65E+00
		Fe-55	8.30E-04	2.30E-03
		Co-60	6.60E-03	1.83E-02
		Ni-59	1.10E-04	3.05E-04
		Ni-63	1.46E-02	4.04E-02
		Sr-90	4.70E-03	1.30E-02
		Y-90	4.70E-03	1.30E-02
		Cs-137	5.00E-03	1.39E-02
		Ba-137m	4.80E-03	1.33E-02
		Pm-147	4.60E-04	1.27E-03
		Sm-151	4.40E-05	1.22E-04
		Eu-154	5.50E-05	1.52E-04
		Pu-238	1.90E-04	5.26E-04
		Pu-241	9.60E-04	2.66E-03
	Alpha	H-3	9.40E-01	2.82E+00
		Fe-55	8.15E-04	2.45E-03
		Co-60	6.48E-03	1.95E-02
		Ni-59	1.08E-04	3.24E-04
		Ni-63	1.43E-02	4.30E-02
		Sr-90	4.62E-03	1.39E-02
		Y-90	4.62E-03	1.39E-02
		Cs-137	4.91E-03	1.47E-02
		Ba-137m	4.72E-03	1.41E-02
		Pm-147	4.52E-04	1.36E-03
		Sm-151	4.30E-05	1.29E-04
		Eu-154	5.40E-05	1.62E-04
		Pu-238	9.82E-04	2.95E-03
		Pu-239	7.90E-05	2.37E-04
		Pu-240	2.65E-04	7.95E-04
		Pu-241	1.75E-02	5.25E-02

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
Lawrence Livermore National Laboratory (LLNL)	Non-alpha	H-3	9.99E-01	6.29E+01
		Sr-90	2.10E-04	1.32E-02
		Y-90	2.10E-04	1.32E-02
		Cs-137	2.20E-04	1.39E-02
		Ba-137m	2.10E-04	1.32E-02
		Th-234	5.10E-05	3.21E-03
		Pa-234m	5.10E-05	3.21E-03
		U-238	5.10E-05	3.21E-03
		Pu-241	5.00E-05	3.15E-03
	Alpha	H-3	9.98E-01	6.29E+01
		Sr-90	2.10E-04	1.32E-02
		Y-90	2.10E-04	1.32E-02
		Cs-137	2.20E-04	1.39E-02
		Ba-137m	2.10E-04	1.32E-02
		Th-234	5.10E-05	3.21E-03
		Pa-234m	5.10E-05	3.21E-03
		U-238	5.10E-05	3.21E-03
		Pu-238	5.00E-05	3.15E-03
		Pu-241	1.00E-03	6.30E-02
Oak Ridge National Laboratory (ORR)	Non-alpha	H-3	6.80E-03	5.58E-03
		Co-60	3.29E-02	2.70E-02
		Ni-59	5.31E-03	4.35E-03
		Ni-63	5.58E-01	4.58E-01
		Sr-90	8.35E-02	6.85E-02
		Y-90	8.35E-02	6.85E-02
		Nb-94	2.50E-04	2.05E-04
		Tc-99	9.99E-04	8.19E-04
		Cs-137	9.45E-02	7.75E-02
		Ba-137m	8.83E-02	7.24E-02
		Sm-151	1.14E-03	9.34E-04
		Eu-154	3.50E-04	2.87E-04
		Eu-155	1.20E-04	9.84E-05
		Th-232	1.00E-04	8.20E-05
		Th-234	1.21E-02	9.82E-03
		Pa-234m	1.21E-02	9.91E-03
		U-238	1.21E-02	9.91E-03
		Pu-238	3.72E-03	3.05E-03
		Pu-239	6.00E-05	4.92E-05
		Pu-240	9.00E-05	7.38E-05
		Pu-241	3.94E-03	3.23E-03
		Am-241	6.00E-05	4.92E-05

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
ORR (cont.)	Alpha	H-3	5.35E-03	3.96E-03
		Co-60	1.85E-02	1.37E-02
		Ni-59	5.55E-03	4.11E-03
		Ni-63	5.57E-01	4.12E-01
		Sr-90	7.79E-02	5.76E-02
		Y-90	7.79E-02	5.76E-02
		Nb-94	2.50E-04	1.85E-04
		Tc-99	3.00E-05	2.22E-05
		Cs-137	8.53E-02	6.31E-02
		Ba-137m	8.08E-02	5.98E-02
		Sm-151	1.10E-03	8.14E-04
		Eu-154	2.50E-04	1.85E-04
		Eu-155	4.00E-05	2.96E-05
		Th-232	1.00E-04	7.40E-05
		Th-234	1.21E-02	8.95E-03
		Pa-234m	1.22E-02	9.03E-03
		U-238	1.22E-02	9.03E-03
		Pu-238	7.70E-03	5.70E-03
		Pu-239	4.90E-04	3.63E-04
		Pu-240	1.58E-03	1.17E-03
		Pu-241	4.34E-02	3.21E-02
		Am-241	1.40E-04	1.04E-04
Paducah Gaseous Diffusion Plant (PGDP)	Non-alpha	Tc-99	9.09E-02	2.46E-01
		Tl-208	1.45E-05	3.92E-05
		Pb-212	3.70E-05	9.99E-05
		Bi-212	3.70E-05	9.99E-05
		Po-212	2.45E-05	6.62E-05
		Po-216	3.70E-05	9.99E-05
		Ra-224	3.70E-05	9.99E-05
		Ra-228	2.24E-04	6.05E-04
		Ac-228	2.24E-04	6.08E-04
		Th-228	3.70E-05	9.99E-05
		Th-231	2.36E-04	6.37E-04
		Th-232	2.48E-03	6.70E-03
		Th-234	3.02E-01	8.15E-01
		Pa-234	3.10E-05	8.37E-05
		Pa-234m	3.02E-01	8.15E-01
		U-235	2.34E-04	6.32E-04
		U-238	3.02E-01	8.15E-01

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
Portsmouth Gaseous Diffusion Plant (PORTS)	Non-alpha	Tc-99	9.09E-02	1.82E-04
		Tl-208	1.40E-05	2.80E-08
		Pb-212	3.80E-05	7.60E-08
		Bi-212	3.80E-05	7.60E-08
		Po-212	2.40E-05	4.80E-08
		Po-216	3.80E-05	7.60E-08
		Ra-224	3.80E-05	7.60E-08
		Ra-228	2.27E-04	4.54E-07
		Ac-228	2.27E-04	4.54E-07
		Th-228	3.80E-05	7.60E-08
		Th-231	2.36E-04	4.72E-07
		Th-232	2.48E-03	4.96E-06
		Th-234	3.02E-01	6.04E-04
		Pa-234	3.10E-05	6.20E-08
		Pa-234m	3.02E-01	6.04E-04
		U-235	2.34E-04	4.68E-07
		U-238	3.01E-01	6.04E-04
Rocky Flats Environmental Technology Site (RFETS)	Non-alpha	Th-232	2.70E-05	2.13E-08
		Th-234	3.32E-03	2.62E-06
		Pa-234m	3.32E-03	2.62E-06
		U-238	3.32E-03	2.62E-06
		Pu-238	1.17E-01	9.25E-05
		Pu-239	1.26E-02	9.95E-06
		Pu-240	4.39E-02	3.47E-05
		Pu-241	8.15E-01	6.45E-04
		Am-241	2.30E-04	1.82E-07
		Cm-244	2.40E-04	1.90E-07
	Alpha	Th-234	8.30E-04	2.16E-05
		Pa-234m	8.30E-04	2.16E-05
		U-238	8.30E-04	2.16E-05
		Pu-238	8.88E-02	2.31E-03
		Pu-239	9.10E-03	2.37E-04
		Pu-240	3.18E-02	8.27E-04
		Pu-241	8.67E-01	2.26E-02
		Am-241	1.70E-04	4.42E-06
		Cm-244	2.30E-04	5.98E-06

TABLE A.1 (Cont.)

Site	Alpha or Non-Alpha	Radionuclide	Relative Activity	Activity Concentration (Ci/m^3)
Savannah River Site (SRS)	Non-alpha	H-3	4.51E–01	2.23E+00
		Fe-55	7.10E–04	3.50E–03
		Co-60	3.56E–02	1.76E–01
		Ni-59	3.36E–03	1.66E–02
		Ni-63	4.07E–01	2.00E+00
		Sr-90	2.41E–02	1.19E–01
		Y-90	2.41E–02	1.19E–01
		Nb-94	1.70E–04	8.38E–04
		Tc-99	1.00E–05	4.93E–05
		Cs-137	2.59E–02	1.28E–01
		Ba-137m	2.45E–02	1.21E–01
		Sm-151	2.80E–04	1.38E–03
		Eu-154	1.30E–04	6.41E–04
		Eu-155	3.00E–05	1.48E–04
		Th-234	1.20E–04	5.92E–04
		Pa-234m	1.20E–04	5.92E–04
		U-238	1.20E–04	5.92E–04
		Pu-238	8.80E–04	4.34E–03
		Pu-240[a]	7.00E–04	3.45E–03
		Pu-241	7.00E–04	3.45E–03
	Alpha	H-3	3.96E–01	1.53E+00
		Fe-55	5.10E–04	1.97E–03
		Co-60	2.63E–02	1.04E–01
		Ni-59	4.27E–03	1.65E–02
		Ni-63	4.63E–01	1.79E+00
		Sr-90	2.44E–02	9.42E–02
		Y-90	2.44E–02	9.42E–02
		Nb-94	2.00E–04	7.72E–04
		Cs-137	2.65E–02	1.02E–01
		Ba-137m	2.51E–02	9.69E–02
		Sm-151	3.10E–04	1.20E–03
		Eu-154	1.10E–04	4.25E–04
		Eu-155	2.00E–05	7.72E–05
		Th-234	1.40E–04	5.40E–04
		Pa-234m	1.40E–04	5.40E–04
		U-238	1.40E–04	5.40E–04
		Pu-238	1.41E–03	5.44E–03
		Pu-239	4.00E–05	1.54E–04
		Pu-240	1.50E–04	5.79E–04
		Pu-241	5.74E–03	2.22E–02

[a] In this table, throughout this technical memorandum, and throughout the PEIS, the correct radionuclide activity for Pu-240 at SRS is as follows: 3.45E–05, relative activity; and 1.68E–04, activity concentration (Ci/m^3). The incorrect numbers for Pu-240 have been used inadvertently to calculate the emission source terms for SRS.

TABLE A.2 Chemical Partitioning Factors (Fractions) for WM PEIS LLMW Technologies[a]

Treatment Code	Chemical Contaminant	Fractions for Aqueous Separation		
		Air Residual	Solid Residual	Product
1	Cyanides[b]	1.00E-08	1.26E-02	9.87E-01
	Methylene chloride	1.00E-05	9.50E-01	5.04E-02
	Silver	4.30E-08	1.26E-02	9.87E-01
	Arsenic	4.30E-08	1.26E-02	9.87E-01
	Barium	4.30E-08	1.26E-02	9.87E-01
	Cadmium	4.30E-08	1.26E-02	9.87E-01
	Cl-2-x[c]	1.00E-05	9.50E-01	5.04E-02
	Cl-3-x[c]	1.00E-05	9.50E-01	5.04E-02
	Cl-4-x[c]	1.00E-05	9.50E-01	5.04E-02
	Cl-F-x[d]	1.00E-05	9.50E-01	5.04E-02
	Chromium	4.30E-08	1.26E-02	9.87E-01
	Toluene, xylene, benzene	1.00E-05	9.50E-01	5.04E-02
	Acetone, 2-butanone, methanol	1.00E-05	1.26E-02	9.87E-01
	Mercury	4.30E-08	1.26E-02	9.87E-01
	Lead	4.30E-08	1.26E-02	9.87E-01
	Selenium	4.30E-08	1.26E-02	9.87E-01
2	Cyanides	1.00E-08	1.81E-01	8.19E-01
	Methylene chloride	1.00E-05	9.58E-01	4.20E-02
	Silver	4.30E-08	1.81E-01	8.19E-01
	Arsenic	4.30E-08	1.81E-01	8.19E-01
	Barium	4.30E-08	1.81E-01	8.19E-01
	Cadmium	4.30E-08	1.81E-01	8.19E-01
	Cl-2-x	1.00E-05	9.58E-01	4.20E-02
	Cl-3-x	1.00E-05	9.58E-01	4.20E-02
	Cl-4-x	1.00E-05	9.58E-01	4.20E-02
	Cl-F-x	1.00E-05	9.58E-01	4.20E-02
	Chromium	4.30E-08	1.81E-01	8.19E-01
	Toluene, xylene, benzene	1.00E-05	9.58E-01	4.20E-01
	Acetone, 2-butanone, methanol	1.00E-05	1.81E-01	8.19E-01
	Mercury	4.30E-08	1.81E-01	8.19E-01
	Lead	4.30E-08	1.81E-01	8.19E-01
	Selenium	4.30E-08	1.81E-01	8.19E-01
3	Methylene chloride	1.00E-05	-	1.00E+00
	Silver	4.30E-08	-	1.00E+00
	Arsenic	4.30E-08	-	1.00E+00
	Barium	4.30E-08	-	1.00E+00
	Cl-2-x	1.00E-05	-	1.00E+00
	Cl-3-x	1.00E-05	-	1.00E+00
	Cl-4-x	1.00E-05	-	1.00E+00
	Cl-F-x	1.00E-05	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	1.00E-05	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	1.00E+00
	Mercury	4.30E-08	-	1.00E+00
	Lead	4.30E-08	-	1.00E+00
	Selenium	4.30E-08	-	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Aqueous Separation (Cont.) Air Residual	Solid Residual	Product
4	Cyanides	1.00E-08	-	1.00E+00
	Silver	4.30E-08	-	1.00E+00
	Cadmium	4.30E-08	-	1.00E+00
	Cl-3-x	1.00E-05	-	1.00E+00
	Cl-4-x	1.00E-05	-	1.00E+00
	Chromium	4.30E-08	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	1.00E+00
	Mercury	4.30E-08	-	1.00E+00
	Lead	4.30E-08	-	1.00E+00
	Selenium	4.30E-08	-	1.00E+00
22	Methylene chloride	1.00E-05	-	1.00E+00
	Silver	4.30E-08	-	1.00E+00
	Cadmium	4.30E-08	-	1.00E+00
	Chromium	4.30E-08	-	1.00E+00
	Lead	4.30E-08	-	1.00E+00

Treatment Code	Chemical Contaminant	Fractions for Organic Separation Air Residual	Liquid Residual	Solid Residual	Product
3	Methylene chloride	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Silver	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Arsenic	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Barium	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Cl-2-x	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Cl-3-x	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Cl-4-x	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Cl-F-x	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Toluene, xylene, benzene	1.00E-05	2.13E-03	9.49E-03	9.88E-01
	Acetone, 2-butanone, methanol	1.00E-05	4.07E-02	9.12E-03	9.50E-01
	Mercury	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Lead	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Selenium	4.30E-08	4.07E-02	9.12E-03	9.50E-01
4	Cyanides	1.00E-12	4.73E-06	1.06E-06	9.42E-05
	Silver	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Cadmium	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Cl-3-x	1.00E-05	2.46E-03	1.11E-02	9.86E-01
	Cl-4-x	1.00E-05	2.46E-03	1.11E-02	9.86E-01
	Chromium	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Toluene, xylene, benzene	1.00E-05	2.46E-03	1.11E-02	9.86E-01
	Acetone, 2-butanone, methanol	1.00E-05	4.73E-02	1.06E-02	9.42E-01
	Mercury	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Lead	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Selenium	4.30E-08	4.73E-02	1.06E-02	9.42E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Organic Separation (Cont.)			
		Air Residual	Liquid Residual	Solid Residual	Product
5	Methylene chloride	1.00E-05	-	3.55E-04	1.00E+00
	Cadmium	4.30E-08	-	5.20E-03	9.95E-01
	Cl-2-x	1.00E-05	-	3.55E-04	1.00E+00
	Cl-3-x	1.00E-05	-	3.55E-04	1.00E+00
	Cl-4-x	1.00E-05	-	3.55E-04	1.00E+00
	Cl-F-x	1.00E-05	-	3.55E-04	1.00E+00
	Chromium	4.30E-08	-	5.20E-03	9.95E-01
	Toluene, xylene, benzene	1.00E-05	-	3.55E-04	1.00E-01
	Acetone, 2-butanone, methanol	1.00E-05	-	5.20E-03	9.95E-01
	Mercury	4.30E-08	-	5.20E-03	9.95E-01
	Lead	4.30E-08	-	5.20E-03	9.95E-01
6	Methylene chloride	1.00E-05	-	5.01E-04	9.99E-01
	Arsenic	4.30E-08	-	8.12E-03	9.92E-01
	Barium	4.30E-08	-	8.12E-03	9.92E-01
	Cadmium	4.30E-08	-	8.12E-03	9.92E-01
	Cl-2-x	1.00E-05	-	5.01E-04	9.99E-01
	Cl-3-x	1.00E-05	-	5.01E-04	9.99E-01
	Cl-4-x	1.00E-05	-	5.01E-04	9.99E-01
	Chromium	4.30E-08	-	8.12E-03	9.92E-01
	Toluene, xylene, benzene	1.00E-05	-	5.01E-04	9.99E-01
	Acetone, 2-butanone, methanol	1.00E-05	-	8.12E-03	9.92E-01
	Mercury	4.30E-08	-	8.12E-03	9.92E-01
	Lead	4.30E-08	-	8.12E-03	9.92E-01
21	Methylene chloride	1.00E-05	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
23	Silver	4.30E-08	-	-	1.00E+00
	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Chromium	4.30E-08	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solid Separation			
		Air Residual	Solid Residual	Salt Residual	Product
1	Cyanides	1.00E-12	7.09E-11	1.00E-04	9.93E-09
	Methylene chloride	1.00E-05	4.50E-04	-	1.00E+00
	Silver	4.30E-08	7.09E-03	-	9.93E-01
	Arsenic	4.30E-08	7.09E-03	-	9.93E-01
	Barium	4.30E-08	7.09E-03	-	9.93E-01
	Cadmium	4.30E-08	7.09E-03	-	9.93E-01
	Cl-2-x	1.00E-05	4.50E-04	-	1.00E+00
	Cl-3-x	1.00E-05	4.50E-04	-	1.00E+00
	Cl-4-x	1.00E-05	4.50E-04	-	1.00E+00
	Cl-F-x	1.00E-05	4.50E-04	-	1.00E+00
	Chromium	4.30E-08	7.09E-03	-	9.93E-01
	Toluene, xylene, benzene	1.00E-05	4.50E-04	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	7.09E-03	-	9.93E-01
	Mercury	4.30E-08	7.09E-03	-	9.93E-01
	Lead	4.30E-08	7.09E-03	-	9.93E-01
	Selenium	4.30E-08	7.09E-03	-	9.93E-01
2	Cyanides	1.00E-12	6.73E-09	1.00E-04	3.27E-09
	Methylene chloride	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Silver	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Arsenic	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Barium	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Barium	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Cl-2-x	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Cl-3-x	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Cl-4-x	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Cl-F-x	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Chromium	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Toluene, xylene, benzene	1.00E-05	3.36E-02	1.39E-04	9.66E-01
	Acetone, 2-butanone, methanol	1.00E-05	6.71E-01	2.77E-03	3.26E-01
	Mercury	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Lead	4.30E-08	6.71E-01	2.77E-03	3.26E-01
	Selenium	4.30E-08	6.71E-01	2.77E-03	3.26E-01
3	Methylene chloride	1.00E-05	-	-	1.00E+00
	Silver	4.30E-08	-	-	1.00E+00
	Arsenic	4.30E-08	-	-	1.00E+00
	Barium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Cl-F-x	1.00E-05	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
	Selenium	4.30E-08	-	-	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solid Separation (Cont.)			
		Air Residual	Solid Residual	Salt Residual	Product
4	Cyanides	1.00E-12	1.73E-09	1.00E-04	8.27E-09
	Silver	4.30E-08	1.73E-01	-	8.27E-01
	Cadmium	4.30E-08	1.73E-01	-	8.27E-01
	Cl-3-x	1.00E-05	8.76E-03	-	9.91E-01
	Cl-4-x	1.00E-05	8.76E-03	-	9.91E-01
	Chromium	4.30E-08	1.73E-01	-	8.27E-01
	Toluene, xylene, benzene	1.00E-05	8.76E-03	-	9.91E-01
	Acetone, 2-butanone, methanol	1.00E-05	1.73E-01	-	8.27E-01
	Mercury	4.30E-08	1.73E-01	-	8.27E-01
	Lead	4.30E-08	1.73E-01	-	8.27E-01
	Selenium	4.30E-08	1.73E-01	-	8.27E-01
5	Methylene chloride	1.00E-05	-	-	1.00E+00
	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Cl-F-x	1.00E-05	-	-	1.00E+00
	Chromium	4.30E-08	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
6	Methylene chloride	1.00E-05	2.94E-03	-	9.97E-01
	Arsenic	4.30E-08	5.68E-02	-	9.43E-01
	Barium	4.30E-08	5.68E-02	-	9.43E-01
	Cadmium	4.30E-08	5.68E-02	-	9.43E-01
	Cl-2-x	1.00E-05	2.94E-03	-	9.97E-01
	Cl-3-x	1.00E-05	2.94E-03	-	9.97E-01
	Cl-4-x	1.00E-05	2.94E-03	-	9.97E-01
	Chromium	4.30E-08	5.68E-02	-	9.43E-01
	Toluene, xylene, benzene	1.00E-05	2.94E-03	-	9.97E-01
	Acetone, 2-butanone, methanol	1.00E-05	5.68E-02	-	9.43E-01
	Mercury	4.30E-08	5.68E-02	-	9.43E-01
	Lead	4.30E-08	5.68E-02	-	9.43E-01
7[e]	Methylene chloride	1.00E-05	1.13E-02	-	9.89E-01
	Silver	4.30E-08	2.23E-01	-	7.77E-01
	Arsenic	4.30E-08	2.23E-01	-	7.77E-01
	Barium	4.30E-08	2.23E-01	-	7.77E-01
	Cadmium	4.30E-08	2.23E-01	-	7.77E-01
	Cl-2-x	1.00E-05	1.13E-02	-	9.89E-01
	Cl-3-x	1.00E-05	1.13E-02	-	9.89E-01
	Cl-4-x	1.00E-05	1.13E-02	-	9.89E-01
	Cl-F-x	1.00E-05	1.13E-02	-	9.89E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solid Separation (Cont.)			
		Air Residual	Solid Residual	Salt Residual	Product
7[e] (Cont.)	Chromium	4.30E-08	2.23E-01	-	7.77E-01
	Toluene, xylene, benzene	1.00E-05	1.13E-02	-	9.89E-01
	Acetone, 2-butanone, methanol	1.00E-05	2.23E-01	-	7.77E-01
	Mercury	4.30E-08	2.23E-01	-	7.77E-01
	Lead	4.30E-08	2.23E-01	-	7.77E-01
	Selenium	4.30E-08	2.23E-01	-	7.77E-01
8[e]	Cyanides	1.00E-12	4.59E-09	1.00E-04	5.41E-09
	Methylene chloride	1.00E-05	2.30E-02	-	9.77E-01
	Silver	4.30E-08	4.59E-01	-	5.41E-01
	Arsenic	4.30E-08	4.59E-01	-	5.41E-01
	Barium	4.30E-08	4.59E-01	-	5.41E-01
	Cadmium	4.30E-08	4.59E-01	-	5.41E-01
	Cl-2-x	1.00E-05	2.30E-02	-	9.77E-01
	Cl-3-x	1.00E-05	2.30E-02	-	9.77E-01
	Cl-4-x	1.00E-05	2.30E-02	-	9.77E-01
	Cl-F-x	1.00E-05	2.30E-02	-	9.77E-01
	Chromium	4.30E-08	4.59E-01	-	5.41E-01
	Toluene, xylene, benzene	1.00E-05	2.30E-02	-	9.77E-01
	Acetone, 2-butanone, methanol	1.00E-05	4.59E-01	-	5.41E-01
	Mercury	4.30E-08	4.59E-01	-	5.41E-01
	Lead	4.30E-08	4.59E-01	-	5.41E-01
	Selenium	4.30E-08	4.59E-01	-	5.41E-01
9[e]	Silver	4.30E-08	-	3.55E-01	6.45E-01
	Arsenic	4.30E-08	-	3.55E-01	6.45E-01
	Barium	4.30E-08	-	3.55E-01	6.45E-01
	Cl-3-x	1.00E-05	-	1.78E-02	9.82E-01
	Chromium	4.30E-08	-	3.55E-01	6.45E-01
	Lead	4.30E-08	-	3.55E-01	6.45E-01
10[e]	Methylene chloride	1.00E-05	4.94E-02	-	9.51E-01
	Cadmium	4.30E-08	9.85E-01	-	1.49E-02
	Cl-2-x	1.00E-05	4.94E-02	-	9.51E-01
	Cl-3-x	1.00E-05	4.94E-02	-	9.51E-01
	Cl-4-x	1.00E-05	4.94E-02	-	9.51E-01
	Cl-F-x	1.00E-05	4.94E-02	-	9.51E-01
	Chromium	4.30E-08	9.85E-01	-	1.49E-02
	Toluene, xylene, benzene	1.00E-05	4.94E-02	-	9.51E-01
	Acetone, 2-butanone, methanol	1.00E-05	9.85E-01	-	1.49E-02
	Mercury	4.30E-08	9.85E-01	-	1.49E-02
	Lead	4.30E-08	9.85E-01	-	1.49E-02

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solid Separation (Cont.)			
		Air Residual	Solid Residual	Salt Residual	Product
11[e]	Methylene chloride	1.00E-05	-	-	1.00E+00
	Silver	4.30E-08	-	-	1.00E+00
	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Cl-F-x	1.00E-05	-	-	1.00E+00
	Chromium	4.30E-08	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
	Selenium	4.30E-08	-	-	1.00E+00
12[e]	Methylene chloride	1.00E-05	-	-	1.00E+00
	Silver	4.30E-08	-	-	1.00E+00
	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Cl-F-x	1.00E-05	-	-	1.00E+00
	Chromium	4.30E-08	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
	Selenium	4.30E-08	-	-	1.00E+00
13[e]	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
21	Methylene chloride	1.00E-05	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
22	Methylene chloride	1.00E-05	4.71E-02	-	9.53E-01
	Silver	4.30E-08	9.41E-01	-	5.90E-02
	Cadmium	4.30E-08	9.41E-01	-	5.90E-02
	Chromium	4.30E-08	9.41E-01	-	5.90E-02
	Lead	4.30E-08	9.41E-01	-	5.90E-02

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solid Separation (Cont.) Air Residual	Solid Residual	Salt Residual	Product
23	Silver	4.30E-08	4.69E-02	-	9.53E-01
	Cadmium	4.30E-08	4.69E-02	-	9.53E-01
	Cl-3-x	1.00E-05	2.44E-03	-	9.98E-01
	Chromium	4.30E-08	4.69E-02	-	9.53E-01
	Acetone, 2-butanone, methanol	1.00E-05	4.69E-02	-	9.53E-01
	Mercury	4.30E-08	4.69E-02	-	9.53E-01
	Lead	4.30E-08	4.69E-02	-	9.53E-01

Treatment Code	Chemical Contaminant	Fractions for Soil Separation Air Residual	Solid Residual	Debris Residual	Product
15	Silver	4.30E-08	7.72E-01	-	2.28E-01
	Arsenic	4.30E-08	7.72E-01	-	2.28E-01
	Barium	4.30E-08	7.72E-01	-	2.28E-01
	Cadmium	4.30E-08	7.72E-01	-	2.28E-01
	Cl-3-x	1.00E-05	3.87E-02	-	9.61E-01
	Cl-4-x	1.00E-05	3.87E-02	-	9.61E-01
	Chromium	4.30E-08	7.72E-01	-	2.28E-01
	Toluene, xylene, benzene	1.00E-05	3.87E-02	-	9.61E-01
	Acetone, 2-butanone, methanol	1.00E-05	7.72E-01	-	2.28E-01
	Mercury	4.30E-08	7.72E-01	-	2.28E-01
	Lead	4.30E-08	7.72E-01	-	2.28E-01
	Selenium	4.30E-08	7.72E-01	-	2.28E-01
16	Silver	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Arsenic	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Barium	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Cadmium	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Cl-3-x	1.00E-05	2.27E-03	1.68E-02	9.81E-01
	Cl-4-x	1.00E-05	2.27E-03	1.68E-02	9.81E-01
	Chromium	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Toluene, xylene, benzene	1.00E-05	2.27E-03	1.68E-02	9.81E-01
	Acetone, 2-butanone, methanol	1.00E-05	4.53E-02	3.34E-01	6.21E-01
	Mercury	4.30E-08	4.53E-02	3.34E-01	6.21E-01
	Lead	4.30E-08	4.53E-02	3.34E-01	6.21E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Debris Separation			
		Air Residual	Solid Residual	Debris Residual	Product
16	Arsenic	4.30E-08	-	9.30E-01	7.02E-02
	Barium	4.30E-08	-	9.30E-01	7.02E-02
	Cadmium	4.30E-08	-	9.30E-01	7.02E-02
	Cl-3-x	1.00E-05	-	9.96E-01	3.61E-03
	Cl-4-x	1.00E-05	-	9.96E-01	3.61E-03
	Chromium	4.30E-08	-	9.30E-01	7.02E-02
	Toluene, xylene, benzene	1.00E-05	-	9.96E-01	3.61E-03
	Acetone, 2-butanone, methanol	1.00E-05	-	9.30E-01	7.02E-02
	Mercury	4.30E-08	-	9.30E-01	7.02E-02
	Lead	4.30E-08	-	9.30E-01	7.02E-02
17	Methylene chloride	1.00E-05	-	9.55E-01	4.47E-02
	Arsenic	4.30E-08	-	1.07E-01	8.93E-01
	Cadmium	4.30E-08	-	1.07E-01	8.93E-01
	Cl-2-x	1.00E-05	-	9.55E-01	4.47E-02
	Cl-3-x	1.00E-05	-	9.55E-01	4.47E-02
	Cl-4-x	1.00E-05	-	9.55E-01	4.47E-02
	Cl-F-x	1.00E-05	-	9.55E-01	4.47E-02
	Chromium	4.30E-08	-	1.07E-01	8.93E-01
	Toluene, xylene, benzene	1.00E-05	-	9.55E-01	4.47E-02
	Acetone, 2-butanone, methanol	1.00E-05	-	1.07E-01	8.93E-01
	Mercury	4.30E-08	-	1.07E-01	8.93E-01
	Lead	4.30E-08	-	1.07E-01	8.93E-01
	Selenium	4.30E-08	-	1.07E-01	8.93E-01
18	Barium	4.30E-08	-	3.46E-02	9.65E-01
	Cadmium	4.30E-08	-	3.46E-02	9.65E-01
	Cl-3-x	1.00E-05	-	9.52E-01	4.84E-02
	Chromium	4.30E-08	-	3.46E-02	9.65E-01
	Mercury	4.30E-08	-	3.46E-02	9.65E-01
	Lead	4.30-08	-	3.46E-02	9.65E-01
19	Silver	4.30E-08	-	-	1.00E+00
	Barium	4.30E-08	-	-	1.00E+00
	Cadmium	4.30E-08	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Cl-F-x	1.00E-05	-	-	1.00E+00
	Chromium	4.30E-08	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
	Mercury	4.30E-08	-	-	1.00E+00
	Lead	4.30E-08	-	-	1.00E+00
	Selenium	4.30E-08	-	-	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Debris Separation (Cont.) Air Residual	Solid Residual	Debris Residual	Product
20	Cyanides	1.00E-12	9.46E-06	7.61E-05	1.45E-05
	Methylene chloride	1.00E-05	9.55E-01	3.80E-02	7.24E-03
	Silver	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Arsenic	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Barium	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Cadmium	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Cl-2-x	1.00E-05	9.55E-01	3.80E-02	7.24E-03
	Cl-3-x	1.00E-05	9.55E-01	3.80E-02	7.24E-03
	Cl-4-x	1.00E-05	9.55E-01	3.80E-02	7.24E-03
	Cl-F-x	1.00E-05	9.55E-01	3.80E-02	7.24E-03
	Chromium	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Acetone, 2-butanone, methanol	1.00E-05	9.46E-02	7.61E-01	1.45E-01
	Mercury	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Lead	4.30E-08	9.46E-02	7.61E-01	1.45E-01
	Selenium	4.30E-08	9.46E-02	7.61E-01	1.45E-01
21	Methylene chloride	1.00E-05	-	-	1.00E+00
	Cl-2-x	1.00E-05	-	-	1.00E+00
	Cl-3-x	1.00E-05	-	-	1.00E+00
	Cl-4-x	1.00E-05	-	-	1.00E+00
	Toluene, xylene, benzene	1.00E-05	-	-	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	-	-	1.00E+00
22	Methylene chloride	1.00E-05	-	9.52E-01	4.76E-02
	Silver	4.30E-08	-	4.90E-02	9.51E-01
	Cadmium	4.30E-08	-	4.90E-02	9.51E-01
	Chromium	4.30E-08	-	4.90E-02	9.51E-01
	Lead	4.30E-08	-	4.90E-02	9.51E-01
23	Silver	4.30E-08	-	5.27E-01	4.73E-01
	Cadmium	4.30E-08	-	5.27E-01	4.73E-01
	Cl-3-x	1.00E-05	-	9.76E-01	2.38E-02
	Chromium	4.30E-08	-	5.27E-01	4.73E-01
	Acetone, 2-butanone, methanol	1.00E-05	-	5.27E-01	4.73E-01
	Mercury	4.30E-08	-	5.27E-01	4.73E-01
	Lead	4.30E-08	-	5.27E-01	4.73E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Lab Pack Separation: Air Residual	Liquid Residual	Debris Residual	Product
23	Silver	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Cadmium	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Cl-3-x	1.00E-05	4.21E-01	1.01E-02	5.69E-01
	Chromium	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Acetone, 2-butanone, methanol	1.00E-05	3.49E-01	1.81E-01	4.71E-01
	Mercury	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Lead	4.30E-08	3.49E-01	1.81E-01	4.71E-01

Treatment Code	Chemical Contaminant	Fractions for Evaporation: Air Residual	Solid Residual	Salt Residual	Mercury Residual	Product
1	Cyanides	1.00E-06	6.75E-07	9.93E-05	-	1.00E-00
	Methylene chloride	1.00E-03	6.74E-03	9.92E-01	-	1.00E-04
	Silver	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Arsenic	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Barium	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Cadmium	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Cl-2-x	1.00E-03	6.74E-03	9.92E-01	-	1.00E-04
	Cl-4-x	1.00E-03	6.74E-03	9.92E-01	-	1.00E-04
	Cl-F-x	1.00E-03	6.74E-03	9.92E-01	-	1.00E-04
	Chromium	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Toluene, xylene, benzene	1.00E-03	6.75E-03	9.92E-01	-	1.00E-04
	Acetone, 2-butanone, methanol	1.00E-03	6.75E-07	9.93E-05	-	9.99E-01
	Mercury	1.00E-11	1.00E-01	1.00E-02	8.90E-01	1.00E-04
	Lead	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	Selenium	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
2	Cyanides	1.00E-06	6.87E-05	3.13E-05	-	1.00E+00
	Methylene chloride	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Silver	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Arsenic	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Barium	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Cadmium	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Cl-2-x	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Cl-3-x	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Cl-4-x	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Cl-F-x	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Chromium	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Toluene, xylene, benzene	1.00E-03	6.87E-01	3.12E-01	-	1.00E-04
	Acetone, 2-butanone, methanol	1.00E-03	6.87E-05	3.13E-05	-	9.99E-01
	Mercury	1.00E-11	1.00E-01	1.00E-02	8.90E-01	1.00E-04
	Lead	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	Selenium	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Evaporation (Cont.)				
		Air Residual	Solid Residual	Salt Residual	Mercury Residual	Product
3	Methylene chloride	1.00E-03	-	9.99E-01	-	1.00E-04
	Silver	1.00E-11	-	1.00E+00	-	1.00E-04
	Arsenic	1.00E-11	-	1.00E+00	-	1.00E-04
	Barium	1.00E-11	-	1.00E+00	-	1.00E-04
	Cl-2-x	1.00E-03	-	9.99E-01	-	1.00E-04
	Cl-3-x	1.00E-03	-	9.99E-01	-	1.00E-04
	Cl-4-x	1.00E-03	-	9.99E-01	-	1.00E-04
	Cl-F-x	1.00E-03	-	9.99E-01	-	1.00E-04
	Toluene, xylene, benzene	1.00E-03	-	1.00E-04	-	9.99E-01
	Acetone, 2-butanone, methanol	1.00E-03	-	1.00E-04	-	9.99E-01
	Mercury	1.00E-11	-	1.00E+00	-	1.00E-04
	Lead	1.00E-11	-	1.00E+00	-	1.00E-04
	Selenium	1.00E-11	-	1.00E+00	-	1.00E-04
4	Cyanides	1.00E-06	8.48E-05	1.52E-05	-	1.00E+00
	Silver	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Cadmium	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Cl-3-x	1.00E-03	8.47E-01	1.52E-01	-	1.00E-04
	Cl-4-x	1.00E-03	8.47E-01	1.52E-01	-	1.00E-04
	Chromium	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Toluene, xylene, benzene	1.00E-03	8.47E-01	1.52E-01	-	1.00E-04
	Acetone, 2-butanone, methanol	1.00E-03	8.48E-05	1.52E-05	-	9.99E-01
	Mercury	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Lead	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Selenium	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
22	Methylene chloride	1.00E-03	8.05E-01	1.94E-01	-	1.00E-04
	Silver	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04
	Cadmium	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04
	Chromium	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04
	Lead	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Wet Air Oxidation		
		Air Residual	Product	Destroy
1,2,3,4,22	Cyanides	1.00E-10	1.00E-04	9.999E-01
	Methylene chloride	1.00E-06	9.99E-04	9.990E-01
	Silver	1.00E-11	1.00E+00	-
	Arsenic	1.00E-11	1.00E+00	-
	Barium	1.00E-11	1.00E+00	-
	Cadmium	1.00E-11	1.00E+00	-
	Cl-2-x	1.00E-06	9.99E-04	9.990E-01
	Cl-3-x	1.00E-06	9.99E-04	9.990E-01
	Cl-4-x	1.00E-06	9.99E-04	9.990E-01
	Cl-F-x	1.00E-06	9.99E-04	9.990E-01
	Chromium	1.00E-11	1.00E+00	-
	Toluene, xylene, benzene	1.00E-06	9.99E-04	9.990E-01
	Acetone, 2-butanone, methanol	1.00E-06	9.99E-04	9.990E-01
	Mercury	1.00E-11	1.00E+00	-
	Lead	1.00E-11	1.00E+00	-
	Selenium	1.00E-11	1.00E+00	-

Treatment Code	Chemical Contaminant	Fractions for Incineration				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
1	Cyanides	9.95E-07	9.95E-01	-	5.00E-03	-
	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
	Arsenic	4.63E-08	1.00E-01	3.20E-05	9.00E-01	-
	Barium	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
	Cadmium	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
	Selenium	1.97E-05	1.28E-02	4.11E-06	9.87E-01	-
2	Cyanides	9.95E-07	9.95E-01	-	5.00E-03	-
	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
	Arsenic	4.63E-08	7.62E-02	2.38E-02	9.00E-01	-
	Barium	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
	Cadmium	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.) Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
2 (Cont.)	Chromium	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
	Selenium	1.87E-05	8.56E-03	2.68E-03	9.89E-01	-
3	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	5.36E-06	4.68E-02	2.28E-05	9.53E-01	-
	Arsenic	4.63E-08	1.00E-01	4.86E-05	9.00E-01	-
	Barium	5.36E-06	4.68E-02	2.28E-05	9.53E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	5.36E-06	4.68E-02	2.28E-05	9.53E-01	-
	Selenium	5.36E-06	4.68E-02	2.28E-05	9.53E-01	-
4	Cyanides	9.95E-07	9.95E-01	-	5.00E-03	-
	Silver	6.27E-06	1.69E-02	1.45E-04	9.83E-01	-
	Cadmium	6.27E-06	1.69E-02	1.45E-04	9.83E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	6.27E-06	1.69E-02	1.45E-04	9.83E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	6.27E-06	1.69E-02	1.45E-04	9.83E-01	-
	Selenium	6.27E-06	1.69E-02	1.45E-04	9.83E-01	-
5	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cadmium	4.71E-06	5.26E-02	1.03E-04	9.47E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	4.71E-06	5.26E-02	1.03E-04	9.47E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	4.71E-06	5.26E-02	1.03E-04	9.47E-01	-

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.)				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
6	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Arsenic	4.63E-08	5.00E-02	5.00E-02	9.00E-01	-
	Barium	7.36E-06	5.28E-03	5.28E-03	9.89E-01	-
	Cadmium	7.36E-06	5.28E-03	5.28E-03	9.89E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	7.36E-06	5.28E-03	5.28E-03	9.89E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	7.36E-06	5.28E-03	5.28E-03	9.89E-01	-
7	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
	Arsenic	4.63E-08	8.69E-02	1.31E-02	9.00E-01	-
	Barium	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
	Cadmium	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
	Selenium	3.84E-05	9.67E-03	1.46E-03	9.89E-01	-
8	Cyanides	9.95E-07	9.95E-01	-	5.00E-03	-
	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-
	Arsenic	4.63E-08	8.09E-02	1.91E-02	9.00E-01	-
	Barium	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-
	Cadmium	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-
	Selenium	1.84E-05	1.06E-02	2.52E-03	9.87E-01	-

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.)				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
9	Silver	3.88E-05	1.05E-02	-	9.89E-01	-
	Arsenic	4.63E-08	1.00E-01	-	9.00E-01	-
	Barium	3.88E-05	1.05E-02	-	9.89E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	3.88E-05	1.05E-02	-	9.89E-01	-
	Lead	3.88E-05	1.05E-02	-	9.89E-01	-
10	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cadmium	2.98E-05	4.31E-03	9.97E-03	9.86E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	2.98E-05	4.31E-03	9.97E-03	9.86E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	2.98E-05	4.31E-03	9.97E-03	9.86E-01	-
11	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	7.06E-06	1.75E-02	2.31E-03	9.80E-01	-
	Cadmium	7.06E-06	1.75E-02	2.31E-03	9.80E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	7.06E-06	1.75E-02	2.31E-03	9.80E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	7.06E-06	1.75E-02	2.31E-03	9.80E-01	-
	Selenium	7.06E-06	1.75E-02	2.31E-03	9.80E-01	-
12	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	6.17E-06	4.85E-02	1.31E-04	9.51E-01	-
	Cadmium	6.17E-06	4.85E-02	1.31E-04	9.51E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	6.17E-06	4.85E-02	1.31E-04	9.51E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	6.17E-06	4.85E-02	1.31E-04	9.51E-01	-
	Selenium	6.17E-06	4.85E-02	1.31E-04	9.51E-01	-

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.)				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
13	Cadmium	6.30E-06	4.82E-02	-	9.52E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Lead	6.30E-06	4.82E-02	-	9.52E-01	-
15	Silver	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
	Arsenic	4.63E-08	9.70E-02	2.98E-03	9.00E-01	-
	Barium	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
	Cadmium	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
	Selenium	3.86E-05	1.10E-02	3.40E-04	9.89E-01	-
16	Silver	3.81E-05	1.01E-02	1.70E-03	9.88E-01	-
	Arsenic	4.63E-08	8.56E-02	1.44E-02	9.00E-01	-
	Barium	3.81E-05	1.01E-02	1.70E-03	9.88E-01	-
	Cadmium	3.81E-05	1.01E-02	1.70E-03	9.88E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	3.81E-05	1.01E-02	1.70E-03	9.88E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	3.81E-05	1.01E-02	1.70E-03	9.88E-01	-
17	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Arsenic	4.63E-08	9.84E-02	1.59E-03	9.00E-01	-
	Cadmium	6.51E-06	4.54E-02	7.32E-04	9.54E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	6.51E-06	4.54E-02	7.32E-04	9.54E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	6.51E-06	4.54E-02	7.32E-04	9.54E-01	-
	Selenium	6.51E-06	4.54E-02	7.32E-04	9.54E-01	-

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.)				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
18	Barium	6.31E-06	4.88E-02	4.67E-04	9.51E-01	-
	Cadmium	6.31E-06	4.88E-02	4.67E-04	9.51E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	6.31E-06	4.88E-02	4.67E-04	9.51E-01	-
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	6.31E-06	4.88E-02	4.67E-04	9.51E-01	-
19	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
	Barium	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
	Cadmium	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
	Selenium	3.33E-05	1.25E-02	2.13E-03	9.85E-01	-
20	Cyanides	9.95E-07	9.95E-01	-	5.00E-03	-
	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
	Arsenic	4.63E-08	9.03E-02	9.73E-03	9.00E-01	-
	Barium	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
	Cadmium	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-F-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
	Selenium	2.78E-05	1.55E-02	1.67E-03	9.83E-01	-
21	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-2-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Cl-4-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Toluene, xylene, benzene	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Acetone, 2-butanone, methanol	1.00E-07	9.99E-05	-	1.00E-09	9.999E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Incineration (Cont.)				
		Air Residual	Liquid Residual	Mercury Residual	Product	Destroy
22	Methylene chloride	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Silver	3.78E-05	1.19E-02	-	9.88E-01	-
	Cadmium	3.78E-05	1.19E-02	-	9.88E-01	-
	Chromium	3.78E-05	1.19E-02	-	9.88E-01	-
	Lead	3.78E-05	1.19E-02	-	9.88E-01	-
23	Silver	2.61E-05	1.73E-02	6.64E-04	9.82E-01	-
	Cadmium	2.61E-05	1.73E-02	6.64E-04	9.82E-01	-
	Cl-3-x	9.90E-08	9.89E-05	-	9.90E-07	9.999E-01
	Chromium	2.61E-05	1.73E-02	6.64E-04	9.82E-01	-
	Acetone, 2-butanone, methanol	1.00E-07	9.90E-05	-	1.00E-09	9.999E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02	-
	Lead	2.61E-05	1.73E-02	6.64E-04	9.82E-01	-

Treatment Code	Chemical Contaminant	Fractions for Shredding	
		Air Residual	Product
16,17,18,20, 21,22,23	Cyanides	1.00E-08	1.00E+00
	Methylene chloride	1.00E-05	1.00E+00
	Silver	4.30E-08	1.00E+00
	Arsenic	4.30E-08	1.00E+00
	Barium	4.30E-08	1.00E+00
	Cadmium	4.30E-08	1.00E+00
	Cl-2-x	1.00E-05	1.00E+00
	Cl-3-x	1.00E-05	1.00E+00
	Cl-4-x	1.00E-05	1.00E+00
	Cl-F-x	1.00E-05	1.00E+00
	Chromium	4.30E-08	1.00E+00
	Toluene, xylene, benzene	1.00E-05	1.00E+00
	Acetone, 2-butanone, methanol	1.00E-05	1.00E+00
	Mercury	4.30E-08	1.00E+00
	Lead	4.30E-08	1.00E+00
	Selenium	4.30E-08	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Thermal Desorption		
		Air Residual	Liquid Residual	Product
16	Silver	4.30E-08	1.00E-03	9.99E-01
	Arsenic	4.30E-08	1.00E-03	9.99E-01
	Barium	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Cl-4-x	1.00E-05	9.90E-01	9.99E-03
	Chromium	4.30E-08	1.00E-03	9.99E-01
	Toluene, xylene, benzene	1.00E-05	9.90E-01	9.99E-03
	Acetone, 2-butanone, methanol	3.00E-05	9.70E-01	3.00E-02
	Mercury	4.30E-08	3.33E-01	6.67E-01
	Lead	4.30E-08	1.00E-03	9.99E-01
17	Methylene chloride	1.00E-05	9.90E-01	9.99E-03
	Arsenic	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Cl-2-x	1.00E-05	9.90E-01	9.99E-03
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Cl-4-x	1.00E-05	9.90E-01	9.99E-03
	Cl-F-x	1.00E-05	9.90E-01	9.99E-03
	Chromium	4.30E-08	1.00E-03	9.99E-01
	Toluene, xylene, benzene	1.00E-05	9.90E-01	9.99E-03
	Acetone, 2-butanone, methanol	3.00E-05	9.70E-01	3.00E-02
	Mercury	4.30E-08	3.33E-01	6.67E-01
	Lead	4.30E-08	1.00E-03	9.99E-01
	Selenium	4.30E-08	1.00E-03	9.99E-01
18	Barium	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Chromium	4.30E-08	1.00E-03	9.99E-01
	Mercury	4.30E-08	3.33E-01	6.67E-01
	Lead	4.30E-08	1.00E-03	9.99E-01
20	Cyanides	1.00E-06	1.00E+00	1.00E-04
	Methylene chloride	1.00E-05	9.90E-01	9.99E-03
	Silver	4.30E-08	1.00E-03	9.99E-01
	Arsenic	4.30E-08	1.00E-03	9.99E-01
	Barium	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Cl-2-x	1.00E-05	9.90E-01	9.99E-03
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Cl-4-x	1.00E-03	9.90E-01	9.99E-03
	Cl-F-x	1.00E-05	9.90E-01	9.99E-03
	Chromium	4.30E-08	1.00E-03	9.90E-01
	Acetone, 2-butanone, methanol	3.00E-05	9.70E-01	3.00E-02
	Mercury	4.30E-08	3.33E-01	6.67E-01
	Lead	4.30E-08	1.00E-03	9.99E-01
	Selenium	4.30E-08	1.00E-03	9.99E-01

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Thermal Desorption (Cont.) Air Residual	Liquid Residual	Product
21	Methylene chloride	1.00E-05	9.90E-01	9.99E-03
	Cl-2-x	1.00E-05	9.90E-01	9.99E-03
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Cl-4-x	1.00E-05	9.90E-01	9.99E-03
	Toluene, xylene, benzene	1.00E-05	9.90E-01	9.99E-03
	Acetone, 2-butanone, methanol	3.00E-05	9.70E-01	3.00E-02
22	Methylene chloride	1.00E-05	9.90E-01	9.99E-03
	Silver	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Chromium	4.30E-08	1.00E-03	9.99E-01
	Lead	4.30E-08	1.00E-03	9.99E-01
23	Silver	4.30E-08	1.00E-03	9.99E-01
	Cadmium	4.30E-08	1.00E-03	9.99E-01
	Cl-3-x	1.00E-05	9.90E-01	9.99E-03
	Chromium	4.30E-08	1.00E-03	9.99E-01
	Acetone, 2-butanone, methanol	3.00E-05	9.70E-01	3.00E-02
	Mercury	4.30E-08	3.33E-01	6.67E-01
	Lead	4.30E-08	1.00E-03	9.90E-01

Treatment Code	Chemical Contaminant	Fractions for Pelletization/Solidification Air Residual	Product
16,17,18,20, 21,22,23	Cyanides	1.00E-06	1.00E+00
	Methylene chloride	1.00E-03	9.99E-01
	Silver	6.80E-14	1.00E+00
	Arsenic	6.80E-14	1.00E+00
	Barium	6.80E-14	1.00E+00
	Cadmium	6.80E-04	1.00E+00
	Cl-2-x	1.00E-03	9.99E-01
	Cl-3-x	1.00E-03	9.99E-01
	Cl-4-x	1.00E-03	9.99E-01
	Cl-F-x	1.00E-03	9.99E-01
	Chromium	6.80E-14	1.00E+00
	Toluene, xylene, benzene	1.00E-03	9.99E-01
	Acetone, 2-butanone, methanol	1.00E-03	9.99E-01
	Mercury	6.80E-14	1.00E+00
	Lead	6.80E-14	1.00E+00
	Selenium	6.80E-14	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Solidification: Air Residual	Fractions for Solidification: Product
All (1-23)	Cyanides	1.00E-06	1.00E+00
	Methylene chloride	1.00E-03	9.99E-01
	Silver	6.80E-14	1.00E+00
	Arsenic	6.80E-14	1.00E+00
	Barium	6.80E-14	1.00E+00
	Cadmium	6.80E-14	1.00E+00
	Cl-2-x	1.00E-03	9.99E-01
	Cl-3-x	1.00E-03	9.99E-01
	Cl-4-x	1.00E-03	9.99E-01
	Cl-F-x	1.00E-03	9.99E-01
	Chromium	6.80E-14	1.00E+00
	Toluene, xylene benzene	1.00E-03	9.99E-01
	Acetone, 2-butanone, methanol	1.00E-03	9.99E-01
	Mercury	6.80E-14	1.00E+00
	Lead	6.80E-14	1.00E+00
	Selenium	6.80E-14	1.00E+00

Treatment Code	Chemical Contaminant	Fractions for Polymer Solidification: Air Residual	Fractions for Polymer Solidification: Product
All (1-23)	Cyanides	1.00E-06	1.00E+00
	Methylene chloride	1.00E-03	9.99E-01
	Silver	6.80E-14	1.00E+00
	Arsenic	6.80E-14	1.00E+00
	Barium	6.80E-14	1.00E+00
	Cadmium	6.80E-14	1.00E+00
	Cl-2-x	1.00E-03	9.99E-01
	Cl-3-x	1.00E-03	9.99E-01
	Cl-4-x	1.00E-03	9.99E-01
	Cl-F-x	1.00E-03	9.99E-01
	Chromium	6.80E-14	1.00E+00
	Toluene, xylene, benzene	1.00E-03	9.99E-01
	Acetone, 2-butanone, methanol	1.00E-03	9.99E-01
	Mercury	6.80E-14	1.00E+00
	Lead	6.80E-14	1.00E+00
	Selenium	6.80E-14	1.00E+00

TABLE A.2 (Cont.)

Treatment Code	Chemical Contaminant	Fractions for Mercury Stabilization	
		Air Residual	Product
All (1-23), except 9,13,14,22	Cyanides	1.00E-06	1.00E+00
	Methylene chloride	1.00E-03	9.99E-01
	Silver	6.80E-14	1.00E+00
	Arsenic	6.80E-14	1.00E+00
	Barium	6.80E-14	1.00E+00
	Cadmium	6.80E-14	1.00E+00
	Cl-2-x	1.00E-03	9.99E-01
	Cl-3-x	1.00E-03	9.99E-01
	Cl-4-x	1.00E-03	9.99E-01
	Cl-F-x	1.00E-03	9.99E-01
	Chromium	6.80E-14	1.00E+00
	Mercury	6.80E-14	1.00E+00
	Lead	6.80E-14	1.00E+00
	Selenium	6.80E-14	1.00E+00

[a] Air Residual, Solid Residual, Liquid Residual, Salt Residual, Debris Residual, Mercury Residual, and Product refer to primary and secondary effluents from the treatment facility.

[b] Destroyed fraction of cyanide is 9.999E-01.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Planned modification of the module 350 solid separation technology will route a higher percentage of waste codes 7 through 13 from the solid residual fraction to the product fraction. This would result in the organic contaminants (e.g., acetone, benzene, and chlorinated compounds) having a solid residual of approximately 1.00E-04, and the product fraction routing would increase correspondingly to more than 9.9E-01. These planned changes in routing are not reflected in the data modeled for this report. When these changes are incorporated into future computer model outputs, certain output data for organic contaminants in other tables in this appendix also will change.

TABLE A.3 Radionuclide and Metal Partitioning Factors (Fractions) for WM PEIS LLMW Technologies

Treatment Code	Radionuclide/ Metal	Fractions for Aqueous Separation		
		Air Residual	Solid Residual	Product
1	All others	4.30E-08	1.26E-02	9.87E-01
	Sr-90	4.30E-08	6.29E-03	9.94E-01
	Y-90	4.30E-08	6.29E-03	9.94E-01
	Tc-99	4.30E-08	6.29E-03	9.94E-01
	Cs-134	4.30E-08	6.29E-03	9.94E-01
	Cs-137	4.30E-08	6.29E-03	9.94E-01
	Ra-224	4.30E-08	6.29E-03	9.94E-01
	Ra-228	4.30E-08	6.29E-03	9.94E-01
2	All others	4.30E-08	1.81E-01	8.19E-01
	Sr-90	4.30E-08	9.07E-02	9.09E-01
	Y-90	4.30E-08	9.07E-02	9.09E-01
	Tc-99	4.30E-08	9.07E-02	9.09E-01
	Cs-134	4.30E-08	9.07E-02	9.09E-01
	Cs-137	4.30E-08	9.07E-02	9.09E-01
	Ra-224	4.30E-08	9.07E-02	9.09E-01
	Ra-228	4.30E-08	9.07E-02	9.09E-01
3	All others	4.30E-08	-	1.00E+00
	Sr-90	4.30E-08	-	1.00E+00
	Y-90	4.30E-08	-	1.00E+00
	Tc-99	4.30E-08	-	1.00E+00
	Cs-134	4.30E-08	-	1.00E+00
	Cs-137	4.30E-08	-	1.00E+00
	Ra-224	4.30E-08	-	1.00E+00
	Ra-228	4.30E-08	-	1.00E+00
4	All others	4.30E-08	-	1.00E+00
	Sr-90	4.30E-08	-	1.00E+00
	Y-90	4.30E-08	-	1.00E+00
	Tc-99	4.30E-08	-	1.00E+00
	Cs-134	4.30E-08	-	1.00E+00
	Cs-137	4.30E-08	-	1.00E+00
	Ra-224	4.30E-08	-	1.00E+00
	Ra-228	4.30E-08	-	1.00E+00
22	All others	4.30E-08	-	1.00E+00
	Sr-90	4.30E-08	-	1.00E+00
	Y-90	4.30E-08	-	1.00E+00
	Tc-99	4.30E-08	-	1.00E+00
	Cs-134	4.30E-08	-	1.00E+00
	Cs-137	4.30E-08	-	1.00E+00
	Ra-224	4.30E-08	-	1.00E+00
	Ra-228	4.30E-08	-	1.00E+00

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Organic Separation			
		Air Residual	Liquid Residual	Solid Residual	Product
3	All others	4.30E-08	4.07E-02	9.12E-03	9.50E-01
	Sr-90	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Y-90	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Tc-99	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Cs-134	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Cs-137	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Ra-224	4.30E-08	9.52E-01	4.57E-04	4.76E-02
	Ra-228	4.30E-08	9.52E-01	4.57E-04	4.76E-02
4	All others	4.30E-08	4.73E-02	1.06E-02	9.42E-01
	Sr-90	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Y-90	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Tc-99	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Cs-134	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Cs-137	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Ra-224	4.30E-08	9.52E-01	5.32E-04	4.72E-02
	Ra-228	4.30E-08	9.52E-01	5.32E-04	4.72E-02
5	All others	4.30E-08	-	5.20E-03	9.95E-01
	Sr-90	4.30E-08	-	5.20E-03	9.95E-01
	Y-90	4.30E-08	-	5.20E-03	9.95E-01
	Tc-99	4.30E-08	-	5.20E-03	9.95E-01
	Cs-134	4.30E-08	-	5.20E-03	9.95E-01
	Cs-137	4.30E-08	-	5.20E-03	9.95E-01
	Ra-224	4.30E-08	-	5.20E-03	9.95E-01
	Ra-228	4.30E-08	-	5.20E-03	9.95E-01
6	All others	4.30E-08	-	8.12E-03	9.92E-01
	Sr-90	4.30E-08	-	8.12E-03	9.92E-01
	Y-90	4.30E-08	-	8.12E-03	9.92E-01
	Tc-99	4.30E-08	-	8.12E-03	9.92E-01
	Cs-134	4.30E-08	-	8.12E-03	9.92E-01
	Cs-137	4.30E-08	-	8.12E-03	9.92E-01
	Ra-224	4.30E-08	-	8.12E-03	9.92E-01
	Ra-228	4.30E-08	-	8.12E-03	9.92E-01
21	All others	4.30E-08	-	-	1.00E+00
	Sr-90	4.30E-08	-	-	1.00E+00
	Y-90	4.30E-08	-	-	1.00E+00
	Tc-99	4.30E-08	-	-	1.00E+00
	Cs-134	4.30E-08	-	-	1.00E+00
	Cs-137	4.30E-08	-	-	1.00E+00
	Ra-224	4.30E-08	-	-	1.00E+00
	Ra-228	4.30E-08	-	-	1.00E+00

TABLE A.3 (Cont.)

		Fractions for Organic Separation (Cont.)			
Treatment Code	Radionuclide/ Metal	Air Residual	Liquid Residual	Solid Residual	Product
23	All others	4.30E-08	-	-	1.00E+00
	Sr-90	4.30E-08	-	-	1.00E+00
	Y-90	4.30E-08	-	-	1.00E+00
	Tc-99	4.30E-08	-	-	1.00E+00
	Cs-134	4.30E-08	-	-	1.00E+00
	Cs-137	4.30E-08	-	-	1.00E+00
	Ra-224	4.30E-08	-	-	1.00E+00
	Ra-228	4.30E-08	-	-	1.00E+00

		Fractions for Solid Separation			
Treatment Code	Radionnuclide/ Metal	Air Residual	Solid Residual	Salt Residual	Product
1	All others	4.30E-08	7.09E-03	-	9.93E-01
2	All others	4.30E-08	6.71E-01	2.77E-03	3.26E-01
3	All others	4.30E-08	-	-	1.00E+00
4	All others	4.30E-08	1.73E-01	-	8.27E-01
5	All others	4.30E-08	-	-	1.00E+00
6	All others	4.30E-08	5.68E-02	-	9.43E-01
7	All others	4.30E-08	2.23E-01	-	7.77E-01
8	All others	4.30E-08	4.59E-01	-	5.41E-01
9	All others	4.30E-08	-	3.55E-01	6.45E-01
10	All others	4.30E-08	9.85E-01	-	1.49E-02
11	All others	4.30E-08	-	-	1.00E+00
12	All others	4.30E-08	-	-	1.00E+00
13	All others	4.30E-08	-	-	1.00E+00
21	All others	4.30E-08	-	-	1.00E+00
22	All others	4.30E-08	9.41E-01	-	5.90E-02
23	All others	4.30E-08	4.69E-02	-	9.53E-01

		Fractions for Soil Separation			
Treatment Code	Radionuclide/ Metal	Air Residual	Solid Residual	Debris Residual	Product
15	All others	4.30E-08	7.72E-01	-	2.28E-01
16	All others	4.30E-08	4.53E-02	3.34E-01	6.21E-01

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Debris Separation: Air Residual	Solid Residual	Debris Residual	Product
16	All others	4.30E-08	-	9.30E-01	7.02E-02
17	All others	4.30E-08	-	1.07E-01	8.93E-01
18	All others	4.30E-08	-	3.46E-02	9.65E-01
19	All others	4.30E-08	-	-	1.00E+00
20	All others	4.30E-08	9.46E-02	7.61E-01	1.45E-01
21	All others	4.30E-08	-	-	1.00E+00
22	All others	4.30E-08	-	4.90E-02	9.51E-01
23	All others	4.30E-08	-	5.27E-01	4.73E-01

Treatment Code	Radionuclide/ Metal	Fractions for Lab Pack Separation: Air Residual	Liquid Residual	Debris Residual	Product
21	All others	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Sr-90	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Y-90	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Tc-99	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Cs-134	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Cs-137	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Ra-224	4.30E-08	3.22E-01	1.91E-01	4.87E-01
	Ra-228	4.30E-08	3.22E-01	1.91E-01	4.87E-01
22	All others	4.30E-08	3.31E-01	2.01E-01	4.68E-01
	Sr-90	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Y-90	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Tc-99	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Cs-134	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Cs-137	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Ra-224	4.30E-08	9.66E-01	1.01E-02	2.35E-02
	Ra-228	4.30E-08	9.66E-01	1.01E-02	2.35E-02
23	All others	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Sr-90	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Y-90	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Tc-99	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Cs-134	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Cs-137	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Ra-224	4.30E-08	3.49E-01	1.81E-01	4.71E-01
	Ra-228	4.30E-08	3.49E-01	1.81E-01	4.71E-01

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Evaporation				
		Air Residual	Solid Residual	Salt Residual	Mercury Residual	Product
1	All others	1.00E-11	6.75E-03	9.93E-01	7.56E-05	1.00E-04
	H-3	7.20E-01	-	-	-	2.80E-01
	Sr-90	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Y-90	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Tc-99	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Cs-134	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Cs-137	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Mercury	1.00E-11	1.00E-01	1.00E-02	8.90E-01	1.00E-04
	Ra-224	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
	Ra-228	1.00E-11	4.33E-04	9.99E-01	-	1.00E-04
2	All others	1.00E-11	6.83E-01	3.11E-01	6.62E-03	1.00E-04
	H-3	7.20E-01	-	-	-	2.80E-01
	Sr-90	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Y-90	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Tc-99	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Cs-134	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Cs-137	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Mercury	1.00E-11	1.00E-01	1.00E-02	8.90E-01	1.00E-04
	Ra-224	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
	Ra-228	1.00E-11	3.45E-02	9.65E-01	-	1.00E-04
3	All others	1.00E-11	-	1.00E+00	-	1.00E-04
	H-3	7.20E-01	-	-	-	2.80E-01
	Sr-90	1.00E-11	-	1.00E+00	-	1.00E-04
	Y-90	1.00E-11	-	1.00E+00	-	1.00E-04
	Tc-99	1.00E-11	-	1.00E+00	-	1.00E-04
	Cs-134	1.00E-11	-	1.00E+00	-	1.00E-04
	Cs-137	1.00E-11	-	1.00E+00	-	1.00E-04
	Mercury	1.00E-11	-	1.00E+00	-	1.00E-04
	Ra-224	1.00E-11	-	1.00E+00	-	1.00E-04
	Ra-228	1.00E-11	-	1.00E+00	-	1.00E-04
4	All others	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	H-3	7.20E-01	-	-	-	2.80E-01
	Sr-90	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Y-90	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Tc-99	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Cs-134	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Cs-137	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Mercury	1.00E-11	8.47E-01	1.52E-01	-	1.00E-04
	Ra-224	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04
	Ra-228	1.00E-11	4.25E-02	9.57E-01	-	1.00E-04

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Evaporation (Cont.) Air Residual	Solid Residual	Salt Residual	Mercury Residual	Product
22	All others	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04
	H-3	7.20E-01	-	-	-	2.80E-01
	Sr-90	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Y-90	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Tc-99	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Cs-134	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Cs-137	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Mercury	1.00E-11	8.06E-01	1.94E-01	-	1.00E-04
	Ra-224	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04
	Ra-228	1.00E-11	4.04E-02	9.59E-01	-	1.00E-04

Treatment Code	Radionuclide/ Metal	Fractions for Wet Air Oxidation Air Residual	Product
1,2,3,4,22	All others	1.00E-11	1.00E+00
	H-3	9.83E-01	1.70E-02

Treatment Code	Radionuclide/ Metal	Fractions for Incineration Air Residual	Liquid Residual	Mercury Residual	Product
1	All others	1.97E-05	1.28E-02	4.11E-06	9.87E-01
	H-3	9.83E-01	1.00E-03	3.08E-08	1.60E-02
	Arsenic	4.63E-08	1.00E-01	3.20E-05	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
2	All others	1.87E-05	8.56E-03	2.68E-03	9.89E-01
	H-3	9.83E-01	9.71E-04	2.92E-05	1.60E-02
	Arsenic	4.63E-08	7.62E-02	2.38E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
3	All others	5.36E-06	4.68E-02	2.28E-05	9.53E-01
	H-3	9.83E-01	1.00E-03	5.63E-08	1.60E-02
	Arsenic	4.63E-08	1.00E-01	4.86E-05	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
4	All others	6.27E-06	1.69E-02	1.45E-04	9.83E-01
	H-3	9.83E-01	9.99E-04	9.94E-07	1.60E-02
	Arsenic	4.63E-08	9.91E-02	8.52E-04	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
5	All others	4.71E-06	5.26E-02	1.03E-04	9.47E-01
	H-3	9.83E-01	1.00E-03	2.82E-07	1.60E-02
	Arsenic	4.63E-08	9.98E-02	1.95E-04	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Incineration (Cont.)			
		Air Residual	Liquid Residual	Mercury Residual	Product
6	All others	7.36E-06	5.28E-03	5.28E-03	9.89E-01
	H-3	9.83E-01	8.74E-04	1.26E-04	1.60E-02
	Arsenic	4.63E-08	5.00E-02	5.00E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
7	All others	3.84E-05	9.67E-03	1.46E-03	9.89E-01
	H-3	9.83E-01	9.86E-04	1.43E-05	1.60E-02
	Arsenic	4.63E-08	8.69E-02	1.31E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
8	All others	1.84E-05	1.06E-02	2.52E-03	9.87E-01
	H-3	9.83E-01	9.78E-04	2.22E-05	1.60E-02
	Arsenic	4.63E-08	8.09E-02	1.91E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
9	All others	3.88E-05	1.05E-02	-	9.89E-01
	H-3	9.83E-01	1.00E-03	-	1.60E-02
	Arsenic	4.63E-08	1.00E-01	-	9.00E-01
	Mercury	1.17E-07	1.05E-02	-	9.90E-01
10	All others	2.98E-05	4.31E-03	9.97E-03	9.86E-01
	H-3	9.83E-01	8.18E-04	1.82E-04	1.60E-02
	Arsenic	4.63E-08	3.02E-02	6.98E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
11	All others	7.06E-06	1.75E-02	2.31E-03	9.80E-01
	H-3	9.83E-01	9.87E-04	1.25E-05	1.60E-02
	Arsenic	4.63E-08	8.83E-02	1.17E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
12	All others	6.17E-06	4.85E-02	1.31E-04	9.51E-01
	H-3	9.83E-01	1.00E-03	3.59E-07	1.60E-02
	Arsenic	4.63E-08	9.97E-02	2.70E-04	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
13	All others	6.30E-06	4.82E-02	-	9.52E-01
	H-3	9.83E-01	1.00E-03	-	1.60E-02
	Arsenic	4.63E-08	1.00E-01	-	9.00E-01
	Mercury	1.17E-07	4.82E-02	-	9.52E-01
15	All others	3.86E-05	1.10E-02	3.40E-04	9.89E-01
	H-3	9.83E-01	9.97E-04	2.94E-06	1.60E-02
	Arsenic	4.63E-08	9.70E-02	2.98E-03	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
16	All others	3.81E-05	1.01E-02	1.70E-03	9.88E-01
	H-3	9.83E-01	9.84E-04	1.59E-05	1.60E-02
	Arsenic	4.63E-08	8.56E-02	1.44E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02

TABLE A.3 (Cont.)

Treatment Code	Radionuclide Metal	Fractions for Incineration (Cont.) Air Residual	Liquid Residual	Mercury Residual	Product
17	All others	6.51E-06	4.54E-02	7.32E-04	9.54E-01
	H-3	9.83E-01	9.98E-04	1.78E-06	1.60E-02
	Arsenic	4.63E-08	9.84E-02	1.59E-03	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
18	All others	6.31E-06	4.88E-02	4.67E-04	9.51E-01
	H-3	9.83E-01	9.99E-04	9.17E-07	1.60E-02
	Arsenic	4.63E-08	9.91E-02	9.46E-04	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
19	All others	3.33E-05	1.25E-02	2.13E-03	9.85E-01
	H-3	9.83E-01	9.85E-04	1.49E-05	1.60E-02
	Arsenic	4.63E-08	8.54E-02	1.46E-02	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
20	All others	2.78E-05	1.55E-02	1.67E-03	9.83E-01
	H-3	9.83E-01	9.91E-04	9.46E-06	1.60E-02
	Arsenic	4.63E-08	9.03E-02	9.73E-03	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
21	All others	2.68E-05	1.47E-02	1.21E-05	9.85E-01
	H-3	9.83E-01	1.00E-03	7.91E-08	1.60E-02
	Arsenic	4.63E-08	9.99E-02	8.23E-05	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02
22	All others	3.78E-05	1.19E-02	-	9.88E-01
	H-3	9.83E-01	1.00E-03	-	1.60E-02
	Arsenic	4.63E-08	1.00E-01	-	9.00E-01
	Mercury	1.17E-07	1.19E-02	-	9.88E-01
23	All others	2.61E-05	1.73E-02	6.64E-04	9.82E-01
	H-3	9.83E-01	9.96E-04	3.67E-06	1.60E-02
	Arsenic	4.63E-08	9.63E-02	3.70E-03	9.00E-01
	Mercury	1.17E-07	1.00E-02	9.80E-01	1.00E-02

Treatment Code	Radionuclide/ Metal	Fractions for Shredding Air Residual	Product
16,17,18,20,21,22,23	All others	4.30E-08	1.00E+00

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Thermal Desorption		
		Air Residual	Liquid Residual	Product
16	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
17	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
18	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
20	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
21	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
22	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01
23	All others	4.30E–08	1.00E–03	9.99E–01
	H-3	1.70E–02	9.82E–01	1.00E–03
	Mercury	4.30E–08	3.33E–01	6.67E–01

Treatment Code	Radionuclide/ Metal	Fractions for Solidification	
		Air Residual	Product
All (1–23)	All others	6.80E–14	1.00E+00
	H-3	1.50E–02	9.85E–01

TABLE A.3 (Cont.)

Treatment Code	Radionuclide/ Metal	Fractions for Mercury Solidification: Air Residual	Fractions for Mercury Solidification: Product
All (1–23), except 9,13,14,22	All others	6.80E–14	1.00E+00
	H-3	1.50E–02	9.85E–01

Treatment Code	Radionuclide/ Metal	Fractions for Polymer Solidification: Air Residual	Fractions for Polymer Solidification: Product
All (1–23)	All others	6.80E–14	1.00E+00
	H-3	1.50E–02	9.85E–01

Treatment Code	Radionuclide/ Metal	Fractions for Pelletization: Air Residual	Fractions for Pelletization: Product
16	All others	1.50E–10	1.00E+00
17	All others	1.50E–10	1.00E+00
18	All others	1.50E–10	1.00E+00
20	All others	1.50E–10	1.00E+00
21	All others	1.50E–10	1.00E+00
22	All others	1.50E–10	1.00E+00
23	All others	1.50E–10	1.00E+00

TABLE A.4 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 2a, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Charleston	Colonie	ETEC	FEMP
Radionuclide (Ci/yr)										
H-3	-	2.7E-02	7.86E-08	-	4.03E-02	3.49E-02	3.19E+00	-	9.88E-02	-
Fe-55	-	-	3.61E-08	-	-	-	1.09E-05	-	-	-
Co-60	-	1.4E-06	2.76E-07	-	1.27E-08	2.83E-06	8.37E-05	-	1.78E-05	-
Ni-59	-	2.3E-07	3.61E-09	-	1.95E-08	4.56E-07	1.09E-06	-	2.87E-06	-
Ni-63	-	2.4E-05	4.85E-07	-	2.00E-06	4.80E-05	1.47E-04	-	3.02E-04	-
Sr-90	-	3.6E-06	1.70E-08	-	9.00E-06	6.86E-06	3.38E-06	-	4.52E-05	-
Y-90	-	3.6E-06	1.70E-08	-	9.00E-06	6.86E-06	3.38E-06	-	4.52E-05	-
Nb-94	-	1.1E-08	1.72E-10	-	8.63E-10	2.15E-08	5.21E-08	-	1.35E-07	-
Sb-125	-	-	7.64E-11	-	-	-	2.32E-08	-	-	-
Tc-99	7.02E-12	4.3E-08		1.30E-12	4.52E-09	8.20E-08	-	1.08E-10	5.40E-07	-
Cs-137	-	4.1E-06	1.80E-08	-	1.01E-05	7.75E-06	3.58E-06	-	5.11E-05	5.48E-08
Ba-137m	-	3.9E-06	1.71E-08	-	9.45E-06	7.59E-06	5.18E-06	-	-	-
Pm-147	-	-	1.97E-09	-	-	-	5.96E-07	-	4.78E-05	-
Sm-151	-	5.0E-08	1.53E-10	-	1.46E-07	9.79E-08	4.63E-08	-	6.16E-07	-
Eu-154	-	1.5E-08	2.20E-10	-	1.52E-08	3.01E-08	6.66E-08	-	1.89E-07	-
Th-234[a]	4.72E-10	5.3E-07	6.78E-10	8.63E-11	5.59E-09	1.04E-06	2.05E-07	1.42E-08	6.54E-06	-
U-235	3.67E-13	-	-	6.70E-14	-	-	-	1.11E-11	-	3.71E-06
U-238	4.72E-10	5.3E-07	6.78E-10	8.63E-11	5.59E-09	1.04E-06	2.05E-07	1.42E-08	6.54E-06	2.89E-09
Pu-238	-	1.6E-07	5.63E-10	-	4.52E-07	3.19E-07	1.71E-07	-	2.01E-06	3.71E-06
Pu-239	-	2.6E-09	-	-	6.12E-09	5.16E-09	-	-	3.24E-08	-
Pu-240	-	3.9E-09	-	-	3.49E-09	7.74E-09	-	-	4.87E-08	-
Pu-241	-	1.7E-07	4.58E-10	-	1.00E-07	3.38E-07	1.39E-07	-	2.13E-06	-
Am-241	-	2.6E-09	-	-	8.59E-09	5.16E-09	-	-	3.24E-08	-
Chemical contaminant (kg/yr)										
Cyanides	8.09E-12	1.0E-09	5.50E-10	-	3.97E-13	2.20E-11	5.80E-11	5.75E-11	1.18E-11	3.73E-08
Methylene chloride	4.98E-09	1.1E-04	1.74E-06	8.16E-07	1.32E-06	4.08E-05	7.72E-06	7.45E-06	3.13E-06	7.50E-04
Silver	1.22E-09	1.9E-06	5.86E-10	-	7.54E-08	8.33E-06	1.43E-07	1.28E-07	1.18E-05	4.25E-05
Arsenic	1.65E-12	4.1E-09	2.52E-10	-	1.38E-10	1.86E-07	3.88E-10	3.66E-10	3.59E-08	9.95E-07
Barium	9.35E-10	4.1E-05	3.26E-08	-	1.38E-06	2.30E-04	6.58E-07	1.36E-07	2.23E-05	1.52E-03
Cadmium	1.22E-09	9.4E-07	1.75E-09	-	6.77E-07	1.04E-05	3.29E-06	3.23E-06	4.84E-06	2.96E-04
Cl-2-x[b]	7.53E-09	5.5E-05	1.81E-06	4.08E-07	1.11E-06	3.67E-05	5.20E-06	4.90E-06	3.18E-06	5.61E-04
Cl-3-x[b]	1.57E-08	5.6E-04	4.24E-05	4.08E-06	1.26E-05	1.52E-03	4.50E-04	4.45E-04	1.65E-04	2.86E-02
Cl-4-x[b]	2.98E-08	4.1E-04	9.13E-06	3.26E-06	5.89E-06	1.63E-04	9.47E-05	9.36E-05	6.54E-05	8.57E-03
Cl-F-x[c]	2.49E-09	6.8E-06	1.35E-06	-	9.26E-07	3.68E-05	1.22E-06	9.05E-07	1.77E-06	3.31E-04
Chromium	2.87E-09	4.6E-05	3.40E-08	-	8.91E-07	2.72E-04	3.40E-06	3.12E-06	2.97E-05	1.79E-03
HC[d]-insoluble	9.61E-10	1.4E-03	1.35E-04	1.02E-05	3.12E-04	5.03E-03	9.06E-04	8.89E-04	3.86E-04	8.03E-02
HC-soluble	9.91E-06	2.6E-03	6.53E-05	9.33E-06	2.08E-04	2.80E-02	1.69E-03	1.62E-03	2.78E-03	3.16E-01
Mercury	1.11E-11	1.7E-07	3.24E-09	-	2.22E-09	6.21E-06	2.15E-08	2.11E-08	5.68E-08	2.57E-05
Lead	1.72E-09	5.5E-05	7.25E-08	-	7.90E-07	3.11E-04	1.06E-06	7.39E-07	5.25E-05	1.36E-03
Selenium	2.61E-11	6.7E-06	9.17E-10	-	3.97E-08	3.92E-05	1.34E-07	1.13E-07	2.18E-06	1.69E-04

TABLE A.4 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	GA	GJPO	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	KCP	LANL
Radionuclide (Ci/yr)										
H-3	-	-	6.67E+01	1.38E+02	2.68E-01	8.99E+00	8.87E+00	3.21E+00	1.11E-01	3.39E+01
Fe-55	-	-	5.87E-06	9.90E-04	1.42E-09	1.01E-04	7.45E-05	3.07E-05	1.70E-06	2.03E-07
Co-60	-	-	6.92E-05	7.58E-03	1.13E-08	7.75E-04	5.70E-04	2.35E-04	1.30E-05	1.61E-06
Ni-59	-	-	3.77E-05	9.90E-05	1.88E-10	1.01E-05	7.45E-06	3.07E-06	1.70E-07	2.69E-08
Ni-63	-	-	3.89E-03	1.33E-02	2.50E-08	1.36E-03	1.00E-03	4.13E-04	2.28E-05	3.57E-06
Sr-90	-	-	1.71E-02	4.64E-04	5.12E-10	4.65E-05	3.42E-05	1.44E-05	7.99E-07	6.25E-07
Y-90	-	-	1.71E-02	4.64E-04	5.12E-10	4.65E-05	3.42E-05	1.44E-05	7.99E-07	6.25E-07
Nb-94	-	-	1.67E-06	4.72E-06	-	4.82E-07	3.55E-07	1.46E-07	8.07E-09	-
Sb-125	-	-	1.24E-08	2.10E-06	-	2.14E-07	1.58E-07	6.51E-08	3.59E-09	-
Tc-99	2.56E-10	1.91E-11	8.59E-06	-	-	-	-	-	-	-
Cs-137	-	-	1.92E-02	4.93E-04	5.45E-10	4.94E-05	3.63E-05	1.52E-05	8.48E-07	6.65E-07
Ba-137m	-	-	1.80E-02	4.69E-04	8.21E-09	4.80E-05	3.53E-05	1.46E-05	8.03E-07	1.17E-06
Pm-147	-	-	3.20E-07	5.40E-05	7.86E-10	5.52E-06	4.06E-06	1.68E-06	9.24E-08	1.12E-07
Sm-151	-	-	2.77E-04	4.19E-06	7.52E-11	4.29E-07	3.15E-07	1.30E-07	7.18E-09	1.08E-08
Eu-154	-	-	2.90E-05	6.03E-06	9.40E-11	6.16E-07	4.53E-07	1.87E-07	1.03E-08	1.34E-08
Th-234	1.88E-08	1.38E-09	1.08E-05	1.86E-05	-	1.90E-06	1.40E-06	5.77E-07	3.19E-08	-
U-235	1.46E-11	1.08E-12	-	-	-	-	-	-	-	-
U-238	1.88E-08	1.38E-09	1.08E-05	1.86E-05	-	1.90E-06	1.40E-06	5.77E-07	3.19E-08	-
Pu-238	-	-	8.62E-04	1.55E-05	3.25E-10	1.58E-06	1.16E-06	4.80E-07	2.65E-08	4.65E-08
Pu-239	-	-	1.17E-05	-	-	-	-	-	-	-
Pu-240	-	-	6.66E-06	-	-	-	-	-	-	-
Pu-241	-	-	1.91E-04	1.26E-05	1.64E-09	1.29E-06	9.46E-07	3.90E-07	2.15E-08	2.35E-07
Am-241	-	-	1.64E-05	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	1.27E-09	3.49E-11	2.12E-08	7.95E-09	3.43E-12	9.69E-12	3.87E-11	2.25E-11	-	2.45E-09
Methylene chloride	9.60E-06	1.43E-07	7.19E-02	1.18E-03	-	5.62E-05	5.24E-05	7.57E-06	2.97E-06	5.95E-04
Silver	2.28E-07	1.08E-08	5.13E-04	1.21E-05	2.66E-08	8.98E-07	9.54E-07	2.35E-07	5.01E-09	2.65E-06
Arsenic	1.18E-09	3.56E-11	1.19E-05	3.76E-07	-	2.06E-09	3.07E-09	9.04E-10	2.67E-12	2.26E-08
Barium	7.10E-06	5.17E-08	1.15E-02	3.99E-04	-	8.39E-06	7.80E-06	5.47E-06	2.00E-07	1.13E-04
Cadmium	8.76E-07	5.84E-08	1.25E-03	1.25E-04	2.96E-09	2.80E-06	2.33E-06	3.67E-07	1.48E-09	1.02E-06
Cl-2-x	6.14E-06	1.01E-07	3.79E-02	5.67E-04	-	3.08E-05	2.91E-05	5.96E-06	1.07E-06	2.03E-04
Cl-3-x	9.06E-05	7.37E-06	4.42E-01	1.05E-02	8.42E-07	5.91E-04	4.80E-04	6.52E-05	5.18E-06	1.07E-03
Cl-4-x	2.44E-05	1.64E-06	2.89E-01	2.78E-03	4.73E-08	2.71E-04	2.64E-04	3.68E-05	3.06E-06	6.11E-04
Cl-F-x	4.64E-06	2.99E-08	2.45E-03	5.03E-04	-	5.20E-06	5.41E-06	3.24E-06	1.35E-06	2.48E-04
Chromium	8.96E-06	1.16E-07	1.43E-02	5.77E-04	1.27E-07	5.88E-06	9.02E-06	3.56E-06	9.89E-09	7.23E-05
HC-insoluble	2.46E-04	1.54E-05	1.20E+00	3.28E-02	1.16E-05	1.34E-03	1.05E-03	1.39E-04	1.77E-06	8.55E-04
HC-soluble	3.20E-03	7.63E-05	2.87E+00	1.41E-01	4.61E-04	1.83E-03	1.47E-03	2.10E-04	1.58E-07	3.44E-02
Mercury	2.63E-08	4.27E-10	2.30E-04	5.99E-06	4.42E-09	2.06E-08	3.00E-08	1.04E-08	4.16E-10	3.76E-06
Lead	1.11E-05	8.19E-08	1.73E-02	6.11E-04	3.02E-08	6.48E-06	1.47E-05	7.77E-06	6.60E-08	4.94E-05
Selenium	7.91E-07	7.36E-09	1.46E-03	3.58E-05	2.42E-08	2.82E-07	2.92E-07	1.02E-07	1.54E-09	2.00E-06

TABLE A.4 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)								
	LBL	LEHR	LLNL	Mare Is	Norfolk	NTS	ORR	Pantex	Pearl H
Radionuclide (Ci/yr)									
H-3	1.76E+02	2.13E-03	6.97E+03	5.82E+00	9.43E-01	1.22E+00	1.26E+01	1.05E+02	5.35E-01
Fe-55	-	-	3.09E-06	8.98E-05	1.58E-05	-	-	2.75E-06	8.14E-06
Co-60	-	2.27E-07	2.49E-05	6.87E-04	1.21E-04	1.5E-04	8.52E-04	2.19E-05	6.23E-05
Ni-59	-	3.66E-08	5.03E-07	8.98E-06	1.58E-06	2.4E-05	1.37E-04	3.64E-07	8.14E-07
Ni-63	-	3.85E-06	6.20E-05	1.21E-03	2.12E-04	2.5E-03	1.45E-02	4.83E-05	1.09E-04
Sr-90	2.48E-07	5.73E-07	1.41E-05	4.23E-05	7.43E-06	3.8E-04	1.97E-03	1.55E-05	3.83E-06
Y-90	2.48E-07	5.73E-07	1.41E-05	4.23E-05	7.43E-06	3.8E-04	1.97E-03	1.55E-05	3.83E-06
Nb-94	-	1.72E-09	2.39E-08	4.27E-07	7.52E-08	1.1E-06	6.48E-06	-	3.88E-08
Sb-125	-	-	3.65E-08	1.90E-07	3.34E-08	-	2.36E-05	-	1.72E-08
Tc-99	-	6.85E-09	6.55E-09	-	-	4.5E-06	2.23E-03	-	-
Cs-137	2.60E-07	6.48E-07	1.51E-05	4.49E-05	7.89E-06	4.3E-04	2.29E-03	1.65E-05	4.07E-06
Ba-137m	2.54E-07	6.09E-07	1.97E-05	4.25E-05	7.47E-06	4.0E-04	2.95E-05	1.59E-05	3.86E-06
Pm-147	-	-	1.69E-07	4.89E-06	8.60E-07	-	-	1.52E-06	4.44E-07
Sm-151	-	7.85E-09	5.47E-08	3.80E-07	6.68E-08	5.2E-06	9.07E-06	1.46E-07	3.45E-08
Eu-154	-	2.41E-09	3.16E-08	5.46E-07	9.60E-08	1.6E-06	3.13E-04	1.82E-07	4.96E-08
Th-234	6.16E-08	8.33E-08	4.15E-06	1.69E-06	2.96E07	5.5E-05	3.13E-04	-	1.53E-07
U-235	-	-	3.64E-12	-	-	-	-	-	-
U-238	6.16E-08	8.33E-08	4.15E-06	1.69E-06	2.96E-07	5.5E-05	9.63E-05	-	1.53E-07
Pu-238	-	2.56E-08	1.84E-07	1.40E-06	2.46E-07	1.7E-05	1.56E-06	6.29E-07	1.27E-07
Pu-239	-	4.14E-10	2.19E-09	-	-	2.7E-07	2.33E-06	-	-
Pu-240	-	6.20E-10	3.29E-09	-	-	4.1E-07	1.02E-04	-	-
Pu-241	6.04E-08	2.71E-08	3.76E-06	1.14E-06	2.00E-07	1.8E-05	1.56E-06	3.18E-06	1.03E-07
Am-241	-	4.14E-10	2.19E-09	-	-	2.7E-07	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	1.53E-10	3.12E-11	1.94E-09	-	-	7.2E-08	8.15E-08	2.01E-09	1.13E-12
Methylene chloride	2.37E-04	1.54E-06	5.22E-04	1.08E-05	1.80E-06	5.6E-05	1.58E-02	1.27E-03	1.09E-06
Silver	3.40E-07	4.25E-08	6.45E-05	4.56E-07	1.20E-07	1.1E-04	1.38E-03	5.48E-06	6.25E-08
Arsenic	4.07E-09	7.11E-12	1.73E-06	5.69E-10	2.15E-10	2.4E-07	3.00E-05	3.06E-08	1.38E-10
Barium	1.80E-05	1.28E-06	1.19E-03	1.48E-05	3.41E-06	6.6E-04	3.27E-02	2.14E-04	1.85E-06
Cadmium	2.58E-06	7.95E-08	1.09E-04	3.14E-06	1.18E-06	3.9E-05	5.67E-03	2.27E-05	5.94E-07
Cl-2-x	1.27E-04	1.77E-06	4.82E-04	9.10E-06	1.87E-06	5.6E-05	1.18E-02	5.92E-04	1.13E-06
Cl-3-x	1.16E-03	8.96E-06	1.32E-02	2.45E-04	8.62E-05	1.2E-03	7.76E-01	6.66E-03	4.50E-05
Cl-4-x	9.02E-04	2.96E-05	1.72E-03	5.23E-05	1.63E-05	1.8E-04	1.47E-01	3.24E-03	1.04E-05
Cl-F-x	8.50E-06	1.44E-06	3.02E-04	9.53E-06	1.29E-06	5.4E-05	6.53E-03	4.50E-04	1.55E-06
Chromium	2.00E-05	8.62E-08	1.48E-03	1.21E-05	4.45E-06	7.8E-04	4.09E-02	6.10E-05	2.68E-06
HC-insoluble	4.10E-03	2.24E-05	6.29E-02	8.02E-04	2.89E-04	5.2E-03	1.58E+00	9.19E-03	1.45E-04
HC-soluble	3.01E-03	1.19E-05	3.43E-01	4.03E-03	1.53E-03	4.7E-02	5.27E+00	1.52E-02	7.70E-04
Mercury	5.07E-08	1.03E-09	4.62E-05	5.13E-08	5.96E-09	3.2E-06	9.25E-04	1.35E-06	3.49E-09
Lead	4.52E-05	3.60E-07	1.61E-03	7.16E-06	2.18E-06	1.1E-03	4.45E-02	1.14E-04	1.42E-06
Selenium	2.68E-07	1.11E-08	2.13E-04	9.88E-07	3.60E-07	1.0E-04	5.34E-03	3.95E-06	1.82E-07

TABLE A.4 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)										
	PGDP	PORTS	Ports Nav	PPPL	Puget So	RFETS	RMI	SNL-CA	SNL-NM	SRS	WVDP
Radionuclide (Ci/yr)											
H-3	1.12E-08	9.02E-07	9.68E-02	3.38E-02	1.27E+01	-	-	2.28E-05	5.92E+00	1.25E+03	5.73E-06
Fe-55	3.58E-08	-	1.72E-06	-	8.84E-05	-	-	-	2.26E-07	1.98E-05	8.46E-06
Co-60	2.74E-07	-	1.32E-05	-	6.76E-04	-	-	-	1.13E-05	9.43E-04	6.47E-05
Ni-59	3.58E-09	-	1.72E-07	-	8.84E-06	-	-	-	1.07E-06	8.83E-05	8.46E-07
Ni-63	4.81E-07	-	2.32E-05	-	1.19E-03	-	-	-	1.29E-04	1.07E-02	1.14E-04
Sr-90	1.69E-08	-	8.11E-07	1.57E-10	4.16E-05	-	-	4.80E-09	7.66E-06	6.33E-04	4.33E-06
Y-90	1.69E-08	3.17E-06	8.11E-07	1.57E-10	4.16E-05	-	-	4.80E-09	7.66E-06	6.33E-04	4.33E-06
Nb-94	1.70E-10	2.46E-09	8.20E-09	-	4.21E-07	-	-	-	5.41E-08	4.47E-06	4.03E-08
Sb-125	7.57E-11	3.17E-06	3.64E-09	-	1.87E-07	-	-	-	-	2.55E-09	2.01E-10
Tc-99	4.92E-05	-	-	-	-	2.56E-12	1.40E-09	-	3.18E-09	2.62E-07	1.79E-08
Cs-137	1.79E-08	-	8.61E-07	1.65E-10	4.42E-05	-	-	5.03E-09	8.24E-06	6.80E-04	4.62E-06
Ba-137m	1.69E-08	-	8.15E-07	1.57E-10	4.18E-05	-	-	4.80E-09	7.79E-06	6.43E-04	4.38E-06
Pm-147	1.95E-09	-	9.38E-08	-	4.82E-06	-	-	-	7.86E-11	6.57E-08	4.61E-07
Sm-151	1.51E-10	-	7.29E-09	-	3.74E-07	-	-	-	8.90E-08	7.35E-06	4.15E-08
Eu-154	2.18E-10	-	1.05E-08	-	5.38E-07	-	-	-	4.13E-08	3.42E-06	5.21E-08
Th-234	1.85E-04	-	3.23E 08	3.82E-11	1.66E-06	1.70E-10	9.37E-08	1.17E-09	3.82E-08	3.17E-06	1.61E-07
U-235	1.44E-07	-	-	-	-	1.32E-13	7.29E-11	-	-	-	1.22E-12
U-238	1.85E-04	-	3.23E-08	3.82E-11	1.66E-06	1.70E-10	9.37E-08	1.17E-09	3.82E-08	3.17E-06	1.61E-07
Pu-238	5.59E-10	-	2.69E-08	-	1.38E-06	-	-	-	2.80E-07	-	1.50E-07
Pu-239	-	-	-	-	-	-	-	-	-	2.31E-05	2.40E-10
Pu-240	-	-	-	-	-	-	-	-	2.23E-07	1.84E-05	1.37E-10
Pu-241	4.54E-10	-	2.19E-08	3.74E-11	1.12E-06	-	-	1.14E-09	2.23E-07	1.84E-05	1.11E-07
Am-241	-	-	-	-	-	-	-	-	-	-	3.37E-10
Chemical contaminant (kg/yr)											
Cyanides	1.16E-09	-	1.05E-07	-	2.03E-10	3.50E-14	3.26E-10	6.92E-11	8.97E-11	1.01E-09	1.92E-11
Methylene chloride	4.84E-04	2.88E-07	5.82E-03	2.97E-07	2.87E-05	4.30E-12	1.86E-05	1.46E-04	1.32E-05	1.21E-02	3.11E-09
Silver	3.13E-06	1.96E-08	1.95E-04	-	5.79E-07	9.49E-10	1.98E-07	4.36E-10	4.14E-07	1.26E-04	1.40E-07
Arsenic	1.43E-07	4.31E-11	8.57E-06	-	5.13E-09	3.12E-10	2.27E-10	2.73E-09	1.11E-08	3.98E-06	4.60E-08
Barium	7.01E-05	5.11E-07	8.63E-03	-	3.27E-05	1.11E-08	1.47E-05	2.48E-08	2.06E-05	3.74E-03	2.00E-06
Cadmium	2.16E-04	2.36E-07	2.34E-04	-	4.66E-07	5.78E-09	5.77E-06	3.51E-07	7.75E-08	4.14E-03	9.10E-07
Cl-2-x	2.78E-04	2.88E-07	5.62E-03	1.48E-07	2.90E-05	4.05E-12	1.30E-05	7.49E-05	1.37E-05	5.99E-03	2.26E-09
Cl-3-x	2.53E-02	1.71E-05	3.45E-02	1.48E-06	1.80E-04	2.14E-10	1.19E-03	1.00E-03	4.36E-05	4.84E-01	3.20E-08
Cl-4-x	5.61E-03	3.33E-06	1.27E-02	1.19E-06	1.05E-04	3.99E-11	2.68E-04	4.27E-04	2.47E-05	1.08E-01	1.11E-08
Cl-F-x	4.16E-05	2.21E-07	3.12E-03	-	3.52E-05	2.51E-12	4.29E-06	6.83E-07	1.18E-05	2.24E-03	1.43E-09
Chromium	2.60E-04	9.21E-07	9.11E-03	-	3.10E-05	2.31E-08	1.14E-05	3.20E-07	1.08E-05	7.56E-03	2.88E-06
HC-insoluble	5.29E-02	5.65E-05	7.64E-02	3.71E-06	7.84E-05	6.84E-10	3.77E-04	3.36E-02	8.02E-05	1.03E+00	7.98E-08
HC-soluble	3.56E-02	3.07E-04	6.80E-01	3.39E-06	1.35E-04	7.75E-09	8.16E-04	1.09E-02	3.37E-05	7.41E-01	9.53E-07
Mercury	2.38E-06	1.20E-09	1.36E-04	-	6.86E-08	1.86E-09	4.26E-09	7.30E-09	1.35E-07	1.02E-04	3.50E-07
Lead	1.66E-04	3.93E-07	1.84E-02	-	6.17E-05	8.72E-09	3.40E-06	7.76E-08	2.86E-05	5.81E-03	4.62E-06
Selenium	7.60E-06	7.07E-08	4.90E-04	-	4.23E-07	6.80E-10	1.84E-07	1.69E-09	2.35E-07	5.89E-04	7.29E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.5 Annual Air Emissions by Site: CH Alpha LLMW — Case 2a, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)								
	Bettis	INEL	LANL	LLNL	Mound	RFETS	SRS	UofMo	WVDP
Radionuclide (Ci/yr)									
H-3	2.60E-09	1.36E+02	1.95E+02	4.51E+03	4.80E-06	-	2.72E+02	-	7.84E-03
Fe-55	-	-	1.02E-06	-	-	-	2.32E-06	-	-
Co-60	4.39E-11	5.27E-04	8.11E-06	-	-	-	1.22E-04	-	1.44E-10
Ni-59	6.72E-11	8.06E-04	1.35E-07	-	-	-	1.95E-05	-	2.20E-10
Ni-63	6.91E-09	7.40E-02	1.79E-05	-	-	-	2.12E-03	-	2.27E-08
Sr-90	3.12E-08	1.41E-03	1.31E-06	2.68E-06	1.01E-09	-	1.56E-04	-	1.02E-07
Y-90	3.12E-08	1.41E-03	1.31E-06	2.68E-06	1.01E-09	-	1.56E-04	-	1.02E-07
Nb-94	3.00E-12	3.53E-05	-	-	-	-	9.15E-07	-	9.85E-12
Sb-125	-	-	-	-	-	-	-	-	-
Tc-99	1.56E-11	-	-	-	-	-	2.39E-08	-	5.10E-11
Cs-137	3.51E-08	1.56E-03	1.39E-06	2.81E-06	1.06E-09	-	1.71E-04	-	1.15E-07
Ba-137m	3.28E-08	1.48E-03	5.90E-06	5.87E-06	1.01E-09	-	1.73E-04	-	1.08E-07
Pm-147	-	-	5.65E-07	-	-	-	-	-	-
Sm-151	5.02E-10	2.27E-05	5.38E-08	-	-	-	2.30E-06	-	1.65E-09
Eu-154	5.23E-11	2.52E-06	6.75E-08	-	-	-	5.94E-07	-	-
Th-234[a]	1.93E-11	1.33E-04	-	1.42E-06	2.45E-10	1.45E-07	7.09E-07	3.70E-14	1.72E-10
U-235	-	-	-	-	-	-	-	-	-
U-238	1.93E-11	1.33E-04	-	1.42E-06	2.45E-10	1.45E-07	7.09E-07	3.70E-14	6.33E-11
Pu-238	1.63E-09	7.81E-05	1.23E-06	1.40E-06	2.40E-10	1.55E-05	9.36E-06	3.92E-12	6.33E-11
Pu-239	2.70E-11	-	9.88E-08	-	-	1.59E-06	2.30E-07	4.01E-13	5.35E-09
Pu-240	1.20E-11	2.52E-06	3.31E-07	-	-	5.54E-06	7.04E-07	1.40E-12	8.87E-11
Pu-241	7.02E-10	6.72E-05	2.19E-05	2.79E-05	4.81E-09	1.51E-04	2.81E-05	3.82E-11	3.94E-11
Am-241	3.00E-11	1.68E-06	-	-	-	2.96E-08	5.35E-08	7.00E-15	2.30E-09
Cm-244	-	-	-	-	-	4.01E-08	7.93E-13	1.00E-14	9.85E-11
Chemical contaminant (kg/yr)									
Cyanides	-	1.85E-08	2.35E-09	1.73E-09	-	2.37E-06	8.11E-09	9.88E-11	1.67E-09
Methylene chloride	2.10E-06	7.32E-02	9.75E-03	1.36E-03	3.00E-05	5.12E-03	9.58E-04	1.16E-07	5.81E-06
Silver	1.50E-10	8.88E-05	1.90E-05	1.75E-05	5.12E-12	7.56E-05	3.02E-05	7.49E-11	4.15E-09
Arsenic	6.01E-09	3.73E-06	4.14E-07	6.17E-08	2.72E-10	8.00E-06	1.29E-06	2.50E-11	9.05E-10
Barium	3.00E-11	3.73E-03	5.41E-05	2.32E-04	1.18E-09	1.50E-03	1.29E-03	5.00E-09	1.86E-08
Cadmium	2.45E-06	4.33E-04	1.30E-05	9.43E-05	1.04E-07	2.09E-04	1.82E-04	1.25E-11	1.21E-08
Cl-2-x[b]	8.73E-06	2.60E-02	3.42E-03	6.65E-04	1.58E-05	3.43E-03	9.54E-04	1.16E-07	7.05E-06
Cl-3-x[b]	4.19E-06	1.49E-01	2.23E-02	1.79E-02	1.72E-03	3.38E-02	1.61E-02	3.25E-07	4.07E-04
Cl-4-x[b]	3.49E-06	8.05E-02	1.02E-02	4.56E-03	3.84E-04	3.52E-02	3.84E-03	2.03E-07	6.38E-05
Cl-F-x[c]	2.25E-10	3.18E-02	4.14E-03	8.27E-04	6.91E-07	9.89E-03	4.67E-04	5.81E-08	3.93E-06
Chromium	3.49E-05	5.21E-03	1.34E-04	4.44E-04	8.90E-08	9.42E-03	1.56E-03	5.00E-09	3.93E-08
HC[d]-insoluble	1.75E-08	1.00E-01	5.31E-03	2.97E-02	3.62E-03	4.19E-02	4.63E-02	5.81E-07	6.92E-04
HC-soluble	3.00E-11	4.77E-01	1.21E-01	1.31E-01	1.24E-03	3.21E+00	2.32E-01	2.90E-08	3.54E-03
Mercury	1.50E-09	1.26E-04	2.26E-05	2.84E-06	5.84E-10	2.07E-05	1.65E-05	2.50E-10	2.68E-08
Lead	4.51E-11	9.59E-03	5.06E-04	4.52E-04	1.98E-08	1.83E-03	2.60E-03	1.25E-08	1.64E-08
Selenium	-	2.23E-04	1.68E-05	3.07E-05	8.30E-14	4.95E-05	6.50E-05	7.49E-11	4.99E-09

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.6 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 2a, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)								
	Ames	ANL-E	BNL	Charleston	Colonie	ETEC	FEMP	GA	GJPO
Radionuclide (Ci/yr)									
H-3	-	5.3E-05	1.05E-06	1.31E-03	-	7.94E-09	-	-	-
Fe-55	-	-	-	1.27E-05	-	-	-	-	-
Co-60	-	5.3E-06	1.07E-07	9.68E-05	-	8.06E-10	-	-	-
Ni-59	-	8.7E-07	1.72E-08	1.27E-06	-	1.30E-10	-	-	-
Ni-63	-	9.1E-05	1.81E-06	1.70E-04	-	1.37E-08	-	-	-
Sr-90	-	1.4E-05	5.84E-06	3.63E-05	-	4.41E-08	-	-	-
Y-90	-	1.4E-05	5.84E-06	3.63E-05	-	4.41E-08	-	-	-
Nb-94	-	4.1E-08	8.11E-10	6.03E-08	-	6.13E-12	-	-	-
Tc-99	5.94E-11	1.7E-07	6.98E-08	2.68E-08	2.17E-09	5.28E-10	2.85E-07	9.53E-09	2.83E-10
Sb-125	-	-	-	3.86E-05	-	-	-	-	-
Cs-137	-	1.6E-05	6.60E-06	5.99E-06	-	4.99E-08	-	-	-
Ba-137m	-	1.4E-05	2.87E-07	6.90E-07	-	2.17E-09	-	-	-
Pm-147	-	-	-	5.36E-08	-	-	-	-	-
Sm-151	-	1.9E-07	3.70E-09	7.70E-08	-	2.79E-11	-	-	-
Eu-154	-	5.7E-08	1.14E-09	2.38E-07	-	8.58E-12	-	-	-
Th-234[a]	3.90E-09	2.0E-06	3.92E-08	2.38E-07	2.37E-08	2.96E-10	1.81E-05	6.12E-07	1.71E-08
U-235	3.03E-12	-	-	-	1.84E-11	-	1.41E-08	4.76E-10	1.33E-11
U-238	3.90E-09	2.0E-06	3.92E-08	1.98E-07	2.37E-08	2.96E-10	1.81E-05	6.12E-07	1.71E-08
Pu-238	-	6.1E-07	1.21E-08	1.61E-07	-	9.11E-11	-	-	-
Pu-239	-	9.8E-09	1.95E-10	-	-	1 47E-12	-	-	-
Pu-240	-	1.5E-08	2.92E-10	-	-	2.20E-12	-	-	-
Pu-241	-	6.5E-07	1.28E-08	-	-	9.65E-11	-	-	-
Am-241	-	9.8E-09	1.95E-10	-	-	1.47E-12	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	7.59E-08	1.0E-05	3.90E-11	3.26E-07	3.26E-07	-	3.53E-04	1.19E-05	3.32E-07
Methylene chloride	1.00E-12	1.1E-10	1.30E-11	1.00E-11	1.00E-11	-	3.61E-09	1.23E-10	4.00E-12
Silver	1.46E-08	2.5E-06	1.83E-07	1.13E-07	1.13E-07	1.38E-09	7.09E-05	2.40E-06	6.78E-08
Arsenic	3.58E-09	4.9E-07	2.17E-08	2.05E-08	2.05E-08	1.64E-10	1.69E-05	5.75E-07	1.61E-08
Barium	3.17E-07	4.5E-05	1.48E-07	7.77E-08	7.77E-08	1.12E-09	1.54E-03	5.26E-05	1.46E-06
Cadmium	1.36E-08	1.8E-06	1.07E-08	7.12E-08	7.12E-08	8.10E-11	6.30E-05	2.13E-06	5.93E-08
Cl-2-x[b]	1.00E-12	1.0E-10	3.80E-11	3.60E-11	3.60E-11	-	3.73E-09	1.25E-10	4.00E-12
Cl-3-x[b]	2.00E-12	2.2E-10	1.51E-09	7.58E-10	7.58E-10	1.10E-11	8.69E-09	3.75E-10	1.80E-11
Cl-4-x[b]	5.00E-12	6.2E-10	8.60E-11	6.30E-11	6.30E-11	1.00E-12	2.17E-08	7.37E-10	2.10E-11
Cl-F-x[c]	-	5.2E-11	3.10E-11	1.70E-11	1.70E-11	-	1.81E-09	6.40E-11	2.00E-12
Chromium	5.65E-07	7.9E-05	4.58E-07	5.31E-07	5.31E-07	3.46E-09	2.74E-03	9.32E-05	2.60E-06
HC[d]-insoluble	-	6.0E-12	1.40E-09	8.53E-10	8.53E-10	1.10E-11	7.68E-09	1.17E-10	1.10E-11
HC-soluble	7.91E-04	1.1E-01	7.85E-03	4.88E-03	4.88E-03	5.93E-05	3.90E+00	1.32E-01	3.71E-03
Mercury	3.07E-10	4.0E-08	1.04E-06	5.88E-07	5.88E-07	7.90E-09	5.17E-06	1.30E-07	9.02E-09
Lead	1.64E-07	2.2E-05	1.62E-07	5.64E-07	5.64E-07	1.23E-09	7.76E-04	2.63E-05	7.33E-07
Selenium	8.69E-09	1.2E-06	1.60E-07	9.26E-08	9.26E-08	1.21E-09	4.27E-05	1.45E-06	4.11E-08

TABLE A.6 (Cont.)

Contaminant	Annual Releases to Water (unit as indicated)								
	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	LANL	LBL	LEHR
Radionuclide (Ci/yr)									
H-3	7.81E-03	1.80E-01	6.14E-05	6.62E-04	5.32E-04	5.18E-05	5.33E-02	4.39E-02	1.17E-06
Fe-55	-	1.74E-03	1.12E-09	6.39E-06	5.13E-06	4.99E-07	9.71E-07	-	-
Co-60	2.76E-06	1.33E-02	8.90E-09	4.88E-05	3.93E-05	3.82E-06	7.72E-06	-	1.19E-07
Ni-59	4.23E-06	1.74E-04	1.48E-10	6.39E-07	5.13E-07	4.99E-08	1.29E-07	-	1.92E-08
Ni-63	4.34E-04	2.34E-02	1.97E-08	8.59E-05	6.90E-05	6.71E-06	1.71E-05	-	2.02E-06
Sr-90	5.70E-03	8.49E-04	1.27E-07	2.60E-05	2.03E-05	2.49E-06	1.39E-05	5.66E-07	3.51E-07
Y-90	5.70E-03	8.49E-04	1.27E-07	2.60E-05	2.03E-05	2.49E-06	1.39E-05	5.66E-07	3.51E-07
Nb-94	1.87E-07	8.29E-06	-	3.04E-08	2.44E-08	2.38E-09	-	-	9.03E-10
Tc-99	2.86E-06	-	-	-	-	-	-	-	4.20E-09
Sb-125	-	3.68E-06	-	1.35E-08	1.09E-08	1.06E-09	-	-	-
Cs-137	6.40E-03	9.01E-04	1.36E-07	2.76E-05	2.15E-05	2.64E-06	1.48E-05	5.93E-07	3.97E-07
Ba-137m	2.05E-03	8.24E-04	6.47E-09	3.02E-06	2.43E-06	2.36E-07	5.62E-06	1.94E-07	3.19E-07
Pm-147	-	9.48E-05	6.20E-10	3.48E-07	2.80E-07	2.72E-08	5.38E-07	-	-
Sm-151	3.16E-05	7.37E-06	5.93E-11	2.70E-08	2.17E-08	2.11E-09	5.15E-08	-	4.11E-09
Eu-154	3.30E-06	1.06E-05	7.42E-11	3.89E-08	3.12E-08	3.04E-09	6.44E-08	-	1.26E-09
Th-234	1.21E-06	3.27E-05	-	1.20E-07	9.64E-08	9.38E-09	-	4.71E-08	4.36E-08
U-235	-	-	-	-	-	-	-	-	-
U-238	1.21E-06	3.27E-05	-	1.20E-07	9.64E-08	9.38E-09	-	4.71E-08	4.36E-08
Pu-238	9.81E-05	2.72E-05	2.56E-10	9.97E-08	8.01E-08	7.79E-09	2.22E-07	-	1.34E-08
Pu-239	1.33E-06	-	-	-	-	-	-	-	2.17E-10
Pu-240	7.58E-07	-	-	-	-	-	-	-	3.25E-10
Pu-241	2.18E-05	2.21E-05	1.29E-09	8.11E-08	6.52E-08	6.34E-09	1.12E-06	4.62E-08	1.42E-08
Am-241	1.86E-06	-	-	-	-	-	-	-	2.17E-10
Chemical contaminant (kg/yr)									
Cyanides	-	6.34E-05	9.00E-12	1.30E-11	1.10E-11	2.00E-12	1.99E-05	-	2.12E-07
Methylene chloride	1.37E-09	6.52E-10	-	6.00E-12	4.00E-12	1.00E-12	2.06E-10	9.00E-12	3.00E-12
Silver	2.73E-04	1.26E-05	2.10E-08	4.46E-07	3.62E-07	3.21E-08	5.91E-06	1.79E-06	8.08E-09
Arsenic	-	3.03E-06	-	7.62E-09	5.85E-09	7.98E-10	9.55E-07	-	6.67E-09
Barium	-	2.73E-04	-	5.20E-08	3.99E-08	5.44E-09	8.75E-05	-	5.14E-09
Cadmium	4.37E-06	1.13E-05	2.34E-09	9.86E-09	7.89E-09	7.98E-10	3.71E-06	2.86E-08	4.20E-08
Cl-2-x	-	7.21E-10	-	1.30E-11	1.00E-11	2.00E-12	2.03E-10	-	1.20E-11
Cl-3-x	-	2.04E-09	2.00E-11	5.32E-10	4.08E-10	5.50E-11	1.79E-09	-	1.90E-11
Cl-4-x	-	3.92E-09	1.00E-12	3.10E-11	2.30E-11	3.00E-12	1.29E-09	-	1.40E-11
Cl-F-x	-	3.37E-10	-	1.10E-11	9.00E-12	1.00E-12	1.01E-10	-	1.00E-12
Chromium	5.47E-05	4.86E-04	1.00E-07	2.37E-07	1.86E-07	2.19E-08	1.62E-04	3.58E-07	1.62E-07
HC-insoluble	-	5.91E-10	2.73E-10	4.93E-10	3.78E-10	5.20E-11	1.87E-08	-	8.00E-12
HC-soluble	-	6.85E-01	1.71E-03	2.76E-03	2.12E-03	2.89E-04	3.36E-01	-	2.48E-05
Mercury	-	6.65E-07	1.34E-07	3.67E-07	2. 82E-07	3.84E-08	9.24E-06	-	4.07E-09
Lead	3.28E-05	1.39E-04	2.39E-08	1.03E-07	8.13E-08	9.01E-09	4.55E-05	2.15E-07	3.07E-07
Selenium	-	7.53E-06	1.91E-08	5.63E-08	4.32E-08	5.89E-09	3.70E-06	-	2.82E-09

TABLE A.6 (Cont.)

Contaminant	Annual Releases to Water (unit as indicated)									
	LLNL	NTS	ORR	Pantex	Pearl H	PGDP	PORTS	RMI	SNL-NM	SRS
Radionuclide (Ci/yr)										
H-3	1.04E+00	1.7E-03	3.50E-03	3.44E-02	1.04E-06	-	-	-	2.46E-06	4.44E-03
Fe-55	-	-	-	6.27E-07	9.99E-09	-	-	-	8.12E-11	1.47E-07
Co-60	-	1.7E-04	3.55E-04	4.99E-06	7.64E-08	-	-	-	4.07E-09	7.35E-06
Ni-59	-	2.8E-05	5.73E-05	8.31E-08	9.99E-10	-	-	-	3.84E-10	6.94E-07
Ni-63	-	2.9E-03	6.03E-03	1.10E-05	1.34E-07	-	-	-	4.64E-08	8.39E-05
Sr-90	9.75E-05	4.4E-04	4.26E-03	3.95E-06	1.10E-07	-	-	-	1.34E-08	9.44E-06
Y-90	9.75E-05	4.4E-04	4.26E-03	3.95E-06	1.10E-07	-	-	-	1.34E-08	9.44E-06
Nb-94	-	1.3E-06	2.70E-06	-	4.76E-11	-	-	-	1.94E-11	3.51E-08
Tc-99	-	5.2E-06	5.10E-05	-	-	1.47E-04	2.48E-06	2.05E-09	5.57E-12	3.92E-09
Sb-125	-	-	-	-	2.11E-11	-	-	-	1.44E-08	-
Cs-137	1.02E-04	5.0E-04	4.82E-03	4.20E-06	1.17E-07	-	-	-	2.80E-09	1.01E-05
Ba-137m	4.58E-06	4.6E-04	9.54E-04	3.63E-06	4.73E-09	-	-	-	3.20E-11	5.06E-06
Pm-147	-	-	-	3.48E-07	5.44E-10	-	-	-	-	-
Sm-151	-	5.9E-06	1.23E-05	3.33E-08	4.23E-11	-	-	-	1.49E-11	5.78E-08
Eu-154	-	1.8E-06	3.78E-06	4.16E-08	6.08E-11	-	-	-	1.37E-11	2.68E-08
Th-234	1.11E-06	6.3E-05	1.31E-04	-	1.88E-10	1.11E-04	5.50E-06	1.24E-07	1.37E-11	2.48E-08
U-235	-	-	-	-	-	8.62E-08	4.26E-09	9.62E-11	-	-
U-238	1.11E-06	6.3E-05	1.31E-04	-	1.88E-10	1.11E-04	5.50E-06	1.24E-07	1.01E-10	2.48E-08
Pu-238	-	1.9E-05	4.02E-05	1.44E-07	1.56E-10	-	-	-	8.00E-11	1.82E-07
Pu-239	-	3.1E-07	6.48E-07	-	-	-	-	-	-	-
Pu-240	-	4.7E-07	9.72E-07	-	-	-	-	-	8.00E-11	1.45E-07
Pu-241	1.09E-06	2.0E-05	4.25E-05	7.26E-07	1.27E-10	-	-	-	-	1.45E-07
Am-241	-	3.1E-07	6.48E-07	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	3.39E-09	3.2E-04	5.47E-04	1.32E-05	-	5.57E-06	4.53E-04	2.28E-06	-	1.95E-06
Methylene chloride	1.16E-09	3.4E-09	1.36E-08	1.50E-10	-	1.36E-10	4.94E-09	2.60E-11	-	2.70E-11
Silver	1.63E-05	6.6E-05	1.96E-04	4.69E-07	3.54E-10	1.42E-06	8.61E-05	1.12E-07	2.65E-09	1.49E-07
Arsenic	1.87E-06	1.6E-05	3.64E-05	4.11E-07	8.90E-11	3.08E-07	2.06E-05	7.40E-08	1.30E-11	6.93E-08
Barium	1.28E-05	1.4E-03	1.85E-03	2.93E-07	6.04E-10	4.68E-06	1.62E-03	8.81E-07	9.00E-11	1.03E-07
Cadmium	9.32E-07	5.8E-05	1.07E-04	2.61E-06	-	1.14E-06	8.33E-05	4.46E-07	4.80E-11	3.89E-07
Cl-2-x	3.29E-09	3.3E-09	3.47E-08	7.51E-10	-	4.87E-10	9.27E-09	1.21E-10	-	1.27E-10
Cl-3-x	1.31E-07	7.0E-09	9.04E-07	9.47E-10	6.00E-12	8.73E-09	4.47E-08	1.53E-10	1.00E-12	7.54E-10
Cl-4-x	7.38E-09	2.0E-08	8.44E-08	8.86E-10	-	8.40E-10	3.00E-08	1.51E-10	-	1.65E-10
Cl-F-x	2.67E-09	1.7E-09	2.09E-08	7.50E-11	-	2.03E-10	2.86E-09	1.20E-11	-	2.30E-11
Chromium	3.97E-05	2.6E-03	3.51E-03	9.97E-06	-	1.28E-05	2.96E-03	3.06E-06	7.88E-10	1.66E-06
HC-insoluble	1.21E-07	2.5E-10	8.56E-07	1.66E-10	1.00E-12	7.82E-09	1.12E-07	2.60E-11	1.00E-12	5.92E-10
HC-soluble	6.77E-01	3.6E+00	9.19E+00	1.46E-04	3.13E-08	5.28E-02	4.70E+00	2.11E-03	4.81E-06	3.21E-03
Mercury	9.02E-05	1.3E-06	6.30E-04	6.75E-08	1.77E-09	5.81E-06	6.19E-05	1.14E-08	6.41E-10	4.34E-07
Lead	1.41E-05	7.2E-04	1.19E-03	1.91E-05	2.18E-10	9.59E-06	9.41E-04	3.43E-06	4.04E-10	2.88E-06
Selenium	1.38E-05	3.9E-05	1.46E-04	1.47E-07	2.98E-10	1.04E-06	5.37E-05	4.60E-08	9.90E-11	8.66E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.7 Annual Contaminant Releases to Water by Site: CH Alpha LLMW — Case 2a, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)					
	INEL	LANL	LLNL	RFETS	SRS	WVDP
Radionuclide (Ci/yr)						
H-3	9.36E-04	7.27E-02	6.07E-01	-	2.18E-03	3.75E-05
Fe-55	-	1.32E-06	-	-	5.61E-08	-
Co-60	4.88E-06	1.05E-05	-	-	2.97E-06	1.33E-08
Ni-59	7.46E-06	1.76E-07	-	-	4.86E-07	2.03E-08
Ni-63	6.85E-04	2.33E-05	-	-	5.26E-05	2.09E-06
Sr-90	1.45E-05	8.79E-05	5.78E-05	-	2.01E-04	9.87E-06
Y-90	1.45E-05	8.79E-05	5.78E-05	-	2.01E-04	9.87E-06
Nb-94	3.26E-07	-	-	-	2.27E-08	9.09E-10
Tc-99	-	-	-	-	7.14E-08	4.93E-09
Sb-125	-	-	-	-	-	-
Cs-137	1.61E-05	9.35E-05	6.05E-05	-	2.24E-04	1.11E-05
Ba-137m	1.37E-05	7.66E-06	2.68E-06	-	1.06E-05	9.93E-06
Pm-147	-	7.35E-07	-	-	-	-
Sm-151	2.10E-07	6.99E-08	-	-	1.54E-07	1.52E-07
Eu-154	2.33E-08	8.78E-08	-	-	2.46E-08	1.58E-08
Th-234[a]	1.24E-06	-	6.51E-07	9.44E-06	2.01E-08	5.84E-09
U-235	-	-	-	-	-	-
U-238	1.24E-06	-	6.51E-07	9.44E-06	2.01E-08	5.84E-09
Pu-238	7.23E-07	1.60E-06	6.38E-07	1.01E-03	5.45E-07	4.93E-07
Pu-239	-	1.28E-07	-	1.04E-04	1.09E-08	8.18E-09
Pu-240	2.33E-08	4.31E-07	-	3.62E-04	1.94E-08	3.64E-09
Pu-241	6.22E-07	2.84E-05	1.28E-05	9.87E-03	8.01E-07	2.13E-07
Am-241	1.55E-08	-	-	1.93E-06	7.18E-09	9.09E-09
Cm-244	-	-	-	2.62E-06	-	-
Chemical contaminant (kg/yr)						
Cyanides	2.24E-06	8.57E-06	2.01E-09	2.26E-02	3.59E-10	5.49E-07
Methylene chloride	2.60E-11	1.26E-09	6.87E-10	2.31E-07	1.22E-10	6.00E-12
Silver	7.96E-08	2.74E-05	9.36E-06	4.51E-03	1.80E-06	7.88E-08
Arsenic	6.96E-08	2.21E-06	1.11E-06	1.08E-03	1.96E-07	2.32E-08
Barium	4.97E-08	5.00E-05	7.57E-06	9.90E-02	1.34E-06	1.59E-06
Cadmium	4.43E-07	2.34E-06	5.48E-07	4.02E-03	9.98E-08	1.01E-07
Cl-2-x[b]	1.27E-10	3.25E-09	1.95E-09	2.34E-07	3.46E-10	1.50E-11
Cl-3-x[b]	1.61E-10	1.23E-07	7.75E-08	4.95E-07	1.37E-08	2.00E-11
Cl-4-x[b]	1.50E-10	7.47E-09	4.38E-09	1.38E-06	7.75E-10	3.40E-11
Cl-F-x[c]	1.20E-11	2.60E-09	1.58E-09	1.15E-07	2.80E-10	3.00E-12
Chromium	1.69E-06	9.52E-05	2.35E-05	1.76E-01	4.21E-06	2.95E-06
HC[d]-insoluble	2.80E-11	8.28E-08	7.18E-08	2.10E-08	1.28E-08	2.00E-12
HC-soluble	2.48E-05	5.35E-01	4.02E-01	2.47E+02	7.17E-02	3.96E-03
Mercury	1.14E-08	7.03E-05	5.35E-05	9.51E-05	9.51E-06	2.41E-09
Lead	3.23E-06	3.10E-05	8.32E-06	4.96E-02	1.50E-06	1.07E-06
Selenium	2.49E-08	1.20E-05	8.21E-06	2.70E-03	1.46E-06	4.54E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.8 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 4, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Charleston	Colonie	ETEC	FEMP
Radionuclide (Ci/yr)										
H-3	-	1.1E-02	7.86E-08	-	2.12E-09	2.51E-09	2.07E-01	-	9.88E-02	8.26E-01
Fe-55	-	-	3.61E-08	-	-	-	6.57E-08	-	-	-
Co-60	-	5.61E-09	2.76E-07	-	3.58E-11	1.21E-08	5.03E-07	-	1.78E-05	1.20E-04
Ni-59	-	9.06E-10	3.61E-09	-	5.47E-11	1.96E-09	6.57E-09	-	2.87E-06	1.94E-05
Ni-63	-	9.53E-08	4.85E-07	-	5.62E-09	2.06E-07	8.83E-07	-	3.02E-04	2.04E-03
Sr-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	4.52E-05	3.06E-04
Y-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	4.52E-05	3.06E-04
Nb-94	-	4.27E-11	1.72E-10	-	2.43E-12	9.22E-11	3.13E-10	-	1.35E-07	9.15E-07
Sb-125	-	-	7.64E-11	-	-	-	1.39E-10	-	-	-
Tc-99	3.82E-11	1.71E-10	-	-	1.27E-11	3.68E-10	-	1.70E-12	5.40E-07	3.71E-06
Cs-137	-	1.61E-08	1.80E-08	-	2.84E-08	3.48E-08	3.26E-08	-	5.11E-05	3.46E-04
Ba-137m	-	1.51E-08	1.71E-08	-	2.65E-08	3.26E-08	3.11E-08	-	4.78E-05	3.23E-04
Pm-147	-	-	1.97E-09	-	-	-	3.58E-09	-	-	-
Sm-151	-	1.94E-10	1.53E-10	-	4.09E-10	4.20E-10	2.78E-10	-	6.16E-07	4.17E-06
Eu-154	-	5.97E-11	2.20E-10	-	4.27E-11	1.29E-10	4.00E-10	-	1.89E-07	1.28E-06
Th-234[a]	2.54E-09	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	6.54E-06	4.80E-05
U-235	1.97E-12	-	-	-	-	-	-	8.90E-14	-	2.90E-09
U-238	2.54E-09	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	6.54E-06	4.80E-05
Pu-238	-	6.34E-10	5.63E-10	-	1.27E-09	1.37E-09	1.03E-09	-	2.01E-06	1.36E-05
Pu-239	-	1.02E-11	-	-	1.72E-11	2.21E-11	-	-	3.24E-08	2.20E-07
Pu-240	-	1.54E-11	-	-	9.81E-12	3.32E-11	-	-	4.87E-08	3.29E-07
Pu-241	-	6.72E-10	4.58E-10	-	2.82E-10	1.45E-09	8.34E-10	-	2.13E-06	1.44E-05
Am-241	-	1.02E-11	-	-	2.41E-11	2.21E-11	-	-	3.24E-08	-
Chemical contaminant (kg/yr)										
Cyanides	4.10E-09	4.0E-09	5.50E-10	-	1.70E-11	1.70E-08	5.79E-10	5.63E-10	1.18E-11	.73E-08
Methylene chloride	9.25E-07	5.3E-05	1.74E-06	3.96E-07	1.22E-06	2.03E-05	7.46E-06	7.26E-06	3.13E-06	2.62E-03
Silver	7.45E-09	8.0E-09	5.86E-10	-	2.80E-10	3.43E-08	1.02E-09	9.85E-10	1.18E-05	1.97E-04
Arsenic	8.19E-10	2.6E-09	2.52E-10	-	8.91E-11	1.19E-08	1.88E-10	1.78E-10	3.59E-08	1.40E-06
Barium	7.09E-08	1.9E-07	3.26E-08	-	2.78E-09	9.30E-07	2.47E-09	1.02E-09	2.23E-05	4.31E-03
Cadmium	7.34E-09	6.3E-09	1.75E-09	-	3.65E-09	5.76E-08	2.43E-08	2.42E-08	4.84E-06	3.72E-04
Cl-2-x[b]	1.27E-06	2.7E-05	1.81E-06	1.98E-07	1.02E-06	1.63E-05	4.84E-06	4.61E-06	3.18E-06	1.45E-03
Cl-3-x[b]	4.25E-06	2.9E-04	4.24E-05	1.98E-06	9.61E-06	9.43E-04	4.38E-04	4.36E-04	1.65E-04	4.19E-02
Cl-4-x[b]	5.54E-06	2.0E-04	9.13E-06	1.58E-06	5.21E-06	1.49E-04	9.22E-05	9.15E-05	6.54E-05	1.08E-02
Cl-F-x[c]	4.62E-07	3.6E-06	1.35E-06	-	8.73E-07	1.19E-05	1.14E-06	8.61E-07	1.77E-06	1.32E-03
Chromium	1.31E-07	2.4E-07	3.40E-08	-	4.20E-09	1.20E-06	2.46E-08	2.35E-08	2.97E-05	5.01E-03
HC[d]-insoluble	1.46E-07	8.1E-04	1.35E-04	4.94E-06	2.97E-04	2.48E-03	8.80E-04	8.71E-04	3.86E-04	1.28E-01
HC-soluble	4.22E-03	1.8E-03	6.53E-05	2.37E-06	1.13E-04	2.66E-03	1.32E-03	1.32E-03	2.78E-03	6.42E-01
Mercury	4.25E-09	6.9E-08	3.24E-09	-	6.67E-10	3.77E-07	5.90E-09	5.77E-09	5.68E-08	3.74E-05
Lead	4.18E-08	3.1E-07	7.25E-08	-	3.89E-09	1.26E-06	8.10E-09	5.78E-09	5.25E-05	5.23E-03
Selenium	1.95E-09	2.9E-08	9.17E-10	-	1.03E-10	1.59E-07	9.03E-10	8.62E-10	2.18E-06	6.35E-04

TABLE A.8 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	GA	GJPO	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	KCP	LANL
Radionuclide (Ci/yr)										
H-3	-	-	8.00E+01	1.38E+02	1.17E-08	5.55E-07	5.83E-07	1.76E-07	5.59E-09	4.00E+01
Fe-55	-	-	1.02E-04	9.90E-04	1.02E-11	2.55E-07	2.68E-07	8.07E-08	2.56E-09	4.30E-07
Co-60	-	-	8.07E-04	7.58E-03	8.08E-11	1.95E-06	2.05E-06	6.17E-07	1.96E-08	1.29E-05
Ni-59	-	-	4.74E-05	9.90E-05	1.35E-12	2.55E-08	2.68E-08	8.07E-09	2.56E-10	1.10E-06
Ni-63	-	-	5.19E-03	1.33E-02	1.79E-10	3.42E-06	3.60E-06	1.08E-06	3.45E-08	1.33E-04
Sr-90	-	-	1.71E-02	4.64E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	8.29E-06
Y-90	-	-	1.71E-02	4.64E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	8.29E-06
Nb-94	-	-	2.13E-06	4.72E-06	-	1.21E-09	1.27E-09	3.84E-10	1.22E-11	5.41E-08
Sb-125	-	-	2.17E-07	2.10E-06	-	5.39E-10	5.66E-10	1.71E-10	5.43E-12	-
Tc-99	5.08E-12	1.84E-13	8.59E-06	-	-	-	-	-	-	3.18E-09
Cs-137	-	-	1.92E-02	4.93E-04	6.12E-11	1.27E-07	1.34E-07	4.03E-08	1.28E-09	8.90E-06
Ba-137m	-	-	1.81E-02	4.69E-04	5.88E-11	1.21E-07	1.27E-07	3.82E-08	1.21E-09	8.97E-06
Pm-147	-	-	5.58E-06	5.40E-05	5.63E-12	1.39E-08	1.46E-08	4.40E-09	1.40E-10	1.13E-07
Sm-151	-	-	2.78E-04	4.19E-06	5.39E-13	1.08E-09	1.13E-09	3.41E-10	1.09E-11	9.99E-08
Eu-154	-	-	2.96E-05	6.03E-06	6.74E-13	1.55E-09	1.63E-09	4.91E-10	1.56E-11	5.49E-08
Th-234	3.39E-10	1.23E-11	1.26E-05	1.86E-05	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11	3.82E-08
U-235	2.64E-13	1.00E-14	-	-	-	4.78E-09	-	-	-	-
U-238	3.39E-10	1.23E-11	1.26E-05	1.86E-05	-	3.97E-09	5.03E-09	1.51E-09	4.82E-11	3.82E-08
Pu-238	-	-	8.63E-04	1.55E-05	2.33E-12	3.23E-09	4.18E-09	1.26E-09	4.00E-11	3.27E-07
Pu-239	-	-	1.17E-05	-	-	-	-	-	-	-
Pu-240	-	-	6.66E-06	-	-	-	-	-	-	2.23E-07
Pu-241	-	-	1.92E-04	1.26E-05	1.18E-11	-	3.40E-09	1.02E-09	3.26E-11	4.59E-07
Am-241	-	-	1.64E-05	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	2.23E-09	4.24E-11	2.15E-08	7.95E-09	1.81E-10	4.76E-10	1.51E-09	8.31E-10	-	2.54E-09
Methylene chloride	2.30E-06	1.29E-07	7.19E-02	1.18E-03	-	3.11E-05	2.64E-05	4.36E-06	2.98E-07	6.08E-04
Silver	2.26E-09	6.84E-11	5.14E-04	1.21E-05	1.91E-10	3.32E-09	4.26E-09	1.17E-09	6.47E-12	3.09E-06
Arsenic	6.86E-10	2.24E-11	1.19E-05	3.76E-07	-	1.10E-09	1.52E-09	3.91E-10	1.27E-12	3.37E-08
Barium	7.36E-08	8.03E-10	1.15E-02	3.99E-04	-	2.25E-08	7.20E-08	4.46E-08	2.59E-10	1.33E-04
Cadmium	2.86E-09	4.14E-10	1.25E-03	1.25E-04	2.12E-11	1.88E-08	1.59E-08	2.35E-09	2.25E-10	1.10E-06
Cl-2-x	2.13E-06	8.69E-08	3.79E-02	5.67E-04	-	1.80E-05	1.54E-05	3.57E-06	1.75E-07	2.17E-04
Cl-3-x	3.97E-05	6.92E-06	4.43E-01	1.05E-02	8.06E-07	4.51E-04	3.55E-04	5.03E-05	7.23E-07	1.12E-03
Cl-4-x	9.98E-06	1.52E-06	2.89E-01	2.78E-03	4.53E-08	1.69E-04	1.73E-04	2.69E-05	3.89E-07	6.36E-04
Cl-F-x	1.26E-06	2.22E-08	2.48E-03	5.03E-04	-	4.74E-06	2.57E-06	2.39E-06	2.37E-07	2.60E-04
Chromium	9.75E-08	1.67E-09	1.43E-02	5.77E-04	9.10E-10	3.72E-08	9.22E-08	4.52E-08	1.13E-09	8.33E-05
HC-insoluble	1.09E-04	1.41E-05	1.20E+00	3.28E-02	1.11E-05	9.90E-04	7.65E-04	1.11E-04	1.52E-06	9.47E-04
HC-soluble	1.79E-03	6.18E-05	2.87E+00	1.41E-01	3.63E-04	9.47E-04	7.51E-04	9.92E-05	1.62E-09	3.49E-02
Mercury	9.17E-09	1.33E-10	2.31E-04	5.99E-06	1.21E-09	6.27E-09	8.99E-09	2.99E-09	1.88E-10	3.90E-06
Lead	1.32E-07	6.29E-10	1.74E-02	6.11E-04	2.17E-10	3.50E-08	1.82E-07	1.03E-07	7.52E-09	7.80E-05
Selenium	3.79E-09	4.89E-11	1.47E-03	3.58E-05	1.73E-10	1.28E-09	2.05E-09	8.27E-10	1.68E-11	2.26E-06

TABLE A.8 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	LBL	LEHR	LLNL	Mare Is	Norfolk	NTS	ORR	Pantex	Pearl H	PGDP
Radionuclide (Ci/yr)										
H-3	9.30E-06	2.44E-04	7.16E+03	4.83E-07	4.71E-08	3.5E-01	1.26E+01	1.05E+02	3.95E-08	1.11E-01
Fe-55	-	-	9.28E-05	2.22E-07	2.16E-08	-	-	2.75E-06	1.81E-08	1.73E-06
Co-60	-	4.69E-10	7.12E-04	1.70E-06	1.66E-07	2.6E-07	8.52E-04	2.19E-05	1.39E-07	1.32E-05
Ni-59	-	7.57E-11	9.51E-06	2.22E-08	2.16E-09	4.2E-08	1.37E-04	3.64E-07	1.81E-09	1.73E-07
Ni-63	-	7.96E-09	1.27E-03	2.98E-06	2.91E-07	4.4E-06	1.45E-02	4.83E-05	2.44E-07	2.33E-05
Sr-90	1.95E-09	1.18E-09	5.72E-05	1.04E-07	1.02E-08	6.6E-07	1.97E-03	1.55E-05	8.53E-09	8.15E-07
Y-90	1.95E-09	1.18E-09	5.72E-05	1.04E-07	1.02E-08	6.6E-07	1.97E-03	1.55E-05	8.53E-09	8.15E-07
Nb-94	-	3.57E-12	4.53E-07	1.06E-09	1.03E-10	2.0E-09	6.48E-06	-	8.63E-11	8.25E-09
Sb-125	-	-	1.96E-07	4.69E-10	4.58E-11	-	-	-	3.83E-11	3.66E-09
Tc-99	-	1.41E-11	4.36E-08	-	-	7.8E-09	2.36E-05	-	-	4.92E-05
Cs-137	2.05E-09	1.33E-09	6.09E-05	1.11E-07	1.08E-08	7.4E-07	2.23E-03	1.65E-05	9.06E-09	8.66E-07
Ba-137m	1.95E-09	1.26E-09	6.31E-05	1.05E-07	1.02E-08	6.9E-07	2.29E-03	1.59E-05	8.58E-09	8.20E-07
Pm-147	-	-	5.06E-06	1.21E-08	1.18E-09	-	-	1.52E-06	9.87E-10	9.44E-08
Sm-151	-	1.63E-11	4.42E-07	9.38E-10	9.16E-11	8.9E-09	2.95E-05	1.46E-07	7.67E-11	7.33E-09
Eu-154	-	4.99E-12	5.80E-07	1.35E-09	1.32E-10	2.7E-09	9.07E-06	1.82E-07	1.10E-10	1.05E-08
Th-234	4.75E-10	1.72E-10	6.00E-06	4.16E-09	4.06E-10	9.5E-08	3.13E-04	-	3.40E-10	1.85E-04
U-235	-	-	1.80E-11	-	-	-	-	-	-	1.44E-07
U-238	4.75E-10	1.72E-10	6.00E-06	4.16E-09	4.06E-10	9.5E-08	3.13E-04	-	3.40E-10	1.85E-04
Pu-238	-	5.30E-11	1.61E-06	3.46E-09	3.38E-10	2.9E-08	9.63E-05	6.29E-07	2.83E-10	2.70E-08
Pu-239	-	8.56E-13	2.60E-09	-	-	4.7E-10	1.56E-06	-	-	-
Pu-240	-	1.28E-12	3.91E-09	-	-	7.1E-10	2.33E-06	-	-	-
Pu-241	4.65E-10	5.62E-11	4.98E-06	2.82E-09	2.75E-10	3.1E-08	1.02E-04	3.18E-06	2.30E-10	2.20E-08
Am-241	-	8.56E-13	2.60E-09	-	-	4.7E-10	1.56E-06	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	5.50E-09	3.35E-11	2.11E-09	-	-	7.2E-08	8.15E-08	2.01E-09	4.07E-11	1.16E-09
Methylene chloride	1.15E-04	1.49E-06	7.81E-04	5.54E-06	1.04E-06	3.4E-05	1.58E-02	1.27E-03	5.86E-07	4.87E-04
Silver	6.52E-09	1.19E-10	6.56E-05	6.27E-10	1.69E-10	2.1E-07	1.38E-03	5.48E-06	1.19E-10	3.14E-06
Arsenic	1.49E-09	5.14E-12	1.74E-06	3.09E-10	1.17E-10	8.7E-08	3.00E-05	3.06E-08	6.99E-11	1.43E-07
Barium	2.79E-07	1.66E-09	1.23E-03	1.04E-07	4.77E-09	3.0E-06	3.27E-02	2.14E-04	4.47E-09	7.03E-05
Cadmium	1.54E-08	5.47E-10	1.16E-04	4.95E-09	1.70E-09	1.0E-07	5.67E-03	2.27E-05	1.06E-09	2.16E-04
Cl-2-x	6.06E-05	1.61E-06	6.26E-04	5.98E-06	1.11E-06	3.4E-05	1.18E-02	5.92E-04	6.23E-07	2.79E-04
Cl-3-x	5.67E-04	8.63E-06	1.47E-02	1.19E-04	4.10E-05	6.1E-04	7.76E-01	6.66E-03	2.12E-05	2.53E-02
Cl-4-x	4.37E-04	2.89E-05	2.73E-03	2.65E-05	8.00E-06	1.3E-04	1.47E-01	3.24E-03	4.44E-06	5.61E-03
Cl-F-x	3.24E-06	1.40E-06	3.26E-04	6.89E-06	9.36E-07	3.0E-05	6.53E-03	4.50E-04	6.46E-07	4.29E-05
Chromium	2.91E-07	4.20E-10	1.52E-03	3.19E-08	6.40E-09	3.8E-06	4.09E-02	6.10E-05	3.36E-08	2.60E-04
HC-insoluble	2.68E-03	2.20E-05	6.81E-02	4.05E-04	1.38E-04	2.6E-03	1.58E+00	9.19E-03	6.91E-05	5.29E-02
HC-soluble	1.07E-03	1.01E-05	3.52E-01	1.73E-04	6.57E-05	4.6E-02	5.27E+00	1.52E-02	3.29E-05	3.56E-02
Mercury	1.40E-08	2.78E-10	4.63E-05	2.22E-08	1.91E-09	9.1E-07	9.25E-04	1.35E-06	1.14E-09	2.38E-06
Lead	6.99E-07	8.57E-10	1.68E-03	1.96E-08	3.10E-09	3.7E-06	4.45E-02	1.14E-04	6.73E-09	1.66E-04
Selenium	4.18E-09	2.45E-11	2.16E-04	1.43E-09	5.17E-10	4.0E-07	5.34E-03	3.95E-06	2.93E-10	7.60E-06

TABLE A.8 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)								
	PORTS	Ports Nav	PPPL	Puget So	RFETS	RMI	SNL-CA	SNL-NM	SRS
Radionuclide (Ci/yr)									
H-3	2.13E+01	6.89E-09	1.48E-09	8.78E-07	-	-	2.28E-05	2.73E-07	1.26E+03
Fe-55	2.17E-04	3.16E-09	-	4.03E-07	-	-	-	4.29E-10	4.66E-05
Co-60	1.67E-03	2.42E-08	-	3.08E-06	-	-	-	2.15E-08	1.15E-03
Ni-59	2.34E-05	3.16E-10	-	4.03E-08	-	-	-	2.03E-09	9.09E-05
Ni-63	3.10E-03	4.25E-08	-	5.42E-06	-	-	-	2.45E-07	1.10E-02
Sr-90	1.36E-04	1.49E-09	3.10E-13	1.90E-07	-	-	4.80E-09	1.46E-08	6.43E-04
Y-90	1.36E-04	1.49E-09	3.10E-13	1.90E-07	-	-	4.80E-09	1.46E-08	6.43E-04
Nb-94	1.11E-06	1.51E-11	-	1.92E-09	-	-	-	1.03E-10	4.59E-06
Sb-125	4.59E-07	6.69E-12	-	8.53E-10	-	-	-	-	5.91E-08
Tc-99	1.23E-06	-	-	-	2.16E-11	3.92E-12	-	6.04E-12	2.62E-07
Cs-137	1.47E-04	1.58E-09	3.25E-13	2.01E-07	-	-	5.03E-09	1.56E-08	6.91E-04
Ba-137m	1.41E-04	1.50E-09	3.10E-13	1.91E-07	-	-	4.80E-09	1.48E-08	6.56E-04
Pm-147	1.18E-05	1.72E-10	-	2.20E-08	-	-	-	-	1.52E-06
Sm-151	1.44E-06	1.34E-11	-	1.71E-09	-	-	-	1.69E-10	7.46E-06
Eu-154	1.45E-06	1.92E-11	-	2.45E-09	-	-	-	7.85E-11	3.58E-06
Th-234	1.13E-05	5.94E-11	7.50E-14	7.57E-09	1.55E-09	2.66E-10	1.17E-09	7.25E-11	3.67E-06
U-235	2.54E-09	-	-	-	1.20E-12	2.07E-13	-	-	-
U-238	1.13E-05	5.94E-11	7.50E-14	7.57E-09	1.55E-09	2.66E-10	1.17E-09	7.25E-11	3.67E-06
Pu-238	5.06E-06	4.93E-11	-	6.29E-09	-	-	-	5.32E-10	2.35E-05
Pu-239	2.58E-08	-	-	-	-	-	-	-	-
Pu-240	3.28E-08	-	-	-	-	-	-	4.23E-10	1.84E-05
Pu-241	4.13E-06	4.01E-11	7.40E-14	5.12E-09	-	-	1.14E-09	4.23E-10	1.87E-05
Am-241	2.84E-08	-	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	1.05E-07	-	-	7.31E-09	1.50E-13	3.25E-10	6.92E-11	2.63E-09	1.02E-09
Methylene chloride	6.00E-03	1.32E-07	1.44E-07	1.38E-05	1.30E-07	1.76E-05	1.46E-04	7.75E-06	1.21E-02
Silver	2.16E-04	2.83E-11	-	5.84E-09	1.17E-08	3.42E-10	4.36E-10	2.32E-09	1.26E-04
Arsenic	1.28E-05	2.35E-11	-	1.85E-09	3.40E-10	1.39E-10	2.73E-09	6.65E-10	3.98E-06
Barium	9.07E-03	7.35E-10	-	3.81E-07	6.21E-08	2.51E-08	2.48E-08	1.46E-07	3.75E-03
Cadmium	2.67E-04	3.63E-10	-	8.12E-09	6.42E-08	4.71E-08	3.51E-07	4.10E-10	4.14E-03
Cl-2-x	5.74E-03	1.32E-07	7.19E-08	1.40E-05	8.77E-08	1.13E-05	7.49E-05	8.42E-06	5.99E-03
Cl-3-x	3.88E-02	7.91E-06	7.19E-07	1.18E-04	7.34E-06	1.15E-03	1.00E-03	2.82E-05	4.85E-01
Cl-4-x	1.38E-02	1.48E-06	5.75E-07	4.61E-05	1.56E-06	2.58E-04	4.27E-04	1.50E-05	1.08E-01
Cl-F-x	3.17E-03	7.50E-08	-	1.39E-05	2.32E-08	3.95E-06	6.83E-07	9.07E-06	2.24E-03
Chromium	9.62E-03	4.52E-09	-	9.60E-07	1.38E-07	5.29E-08	3.20E-07	1.34E-07	7.57E-03
HC-insoluble	8.57E-02	2.63E-05	1.80E-06	6.87E-05	1.54E-05	3.07E-04	3.36E-02	7.69E-05	1.03E+00
HC-soluble	7.14E-01	1.31E-05	8.63E-07	6.52E-06	3.15E-05	1.82E-04	1.09E-02	2.64E-06	7.44E-01
Mercury	2.09E-04	3.89E-10	-	1.99E-08	2.29E-09	1.42E-09	7.30E-09	6.73E-09	1.02E-04
Lead	1.90E-02	5.67E-10	-	9.29E-07	9.03E-08	1.42E-08	7.76E-08	3.36E-07	5.81E-03
Selenium	5.59E-04	1.02E-10	-	5.63E-09	8.03E-09	2.83E-10	1.69E-09	2.09E-09	5.90E-04

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.9 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 4, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)									
	Ames	ANL-E	Charleston	Colonie	ETEC	FEMP	GA	GJPO	Hanford	INEL
Radionuclide (Ci/yr)										
H-3	-	5.2E-05	9.89E-04	-	7.94E-09	1.13E-05	-	-	7.81E-03	1.80E-01
Fe-55	-	-	9.53E-06	-	-	-	-	-	9.99E-09	1.74E-03
Co-60	-	5.3E-06	7.29E-05	-	8.06E-10	1.15E-06	-	-	2.84E-06	1.33E-02
Ni-59	-	8.5E-07	9.53E-07	-	1.30E-10	1.85E-07	-	-	4.23E-06	1.74E-04
Ni-63	-	9.0E-05	1.28E-04	-	1.37E-08	1.95E-05	-	-	4.35E-04	2.34E-02
Sr-90	-	1.3E-05	4.99E-06	-	4.41E-08	8.52E-06	-	-	5.70E-03	8.49E-04
Y-90	-	1.3E-05	4.99E-06	-	4.41E-08	8.52E-06	-	-	5.70E-03	8.49E-04
Nb-94	-	4.0E-08	4.54E-08	-	6.13E-12	8.73E-09	-	-	1.87E-07	8.29E-06
Sb-125	-	-	2.02E-08	-	-	-	-	-	2.11E-11	3.68E-06
Tc-99	5.94E-11	1.6E-07	-	2.98E-10	5.28E-10	3.87E-07	9.26E-09	2.58E-10	2.86E-06	-
Cs-137	-	1.5E-05	5.30E-06	-	4.99E-08	9.63E-06	-	-	6.40E-03	9.01E-04
Ba-137m	-	1.4E-05	4.52E-06	-	4.17E-08	8.68E-06	-	-	2.05E-03	8.24E-04
Pm-147	-	-	5.20E-07	-	-	-	-	-	5.44E-10	9.48E-05
Sm-151	-	1.8E-07	4.04E-08	-	2.79E-11	3.98E-08	-	-	3.16E-05	7.37E-06
Eu-154	-	5.6E-08	5.80E-08	-	8.58E-12	1.22E-08	-	-	3.30E-06	1.06E-05
Th-234[a]	3.90E-09	1.9E-06	1.79E-07	1.78E-08	2.96E-10	1.85E-05	6.11E-07	1.70E-08	1.21E-06	3.27E-05
U-235	3.03E-12	-	-	1.39E-11	-	1.41E-08	4.75E-10	1.32E-11	-	-
U-238	3.90E-09	1.9E-06	1.79E-07	1.78E-08	2.96E-10	1.85E-05	6.11E-07	1.70E-08	1.21E-06	3.27E-05
Pu-238	-	6.0E-07	1.49E-07	-	9.11E-11	1.30E-07	-	-	9.81E-05	2.72E-05
Pu-239	-	9.6E-09	-	-	1.47E-12	2.10E-09	-	-	1.33E-06	-
Pu-240	-	1.5E-08	-	-	2.20E-12	3.14E-09	-	-	7.58E-07	-
Pu-241	-	6.3E-07	1.21E-07	-	9.65E-11	1.37E-07	-	-	2.18E-05	2.21E-05
Am-241	-	9.6E-09	-	-	1.47E-12	2.10E-09	-	-	1.86E-06	-
Chemical contaminant (kg/yr)										
Cyanides	7.59E-08	1.0E-05	3.26E-07	3.26E-07	-	3.53E-04	1.19E-05	3.32E-07	1.37E-09	6.34E-05
Methylene chloride	1.00E-12	1.0E-10	4.00E-12	4.00E-12	-	3.64E-09	1.22E-10	4.00E-12	2.73E-04	6.52E-10
Silver	1.46E-08	2.0E-06	1.16E-08	1.16E-08	1.38E-09	7.60E-05	2.39E-06	6.65E-08	8.90E-11	1.26E-05
Arsenic	3.58E-09	4.9E-07	1.02E-08	1.02E-08	1.64E-10	1.69E-05	5.73E-07	1.60E-08	6.04E-10	3.03E-06
Barium	3.17E-07	4.5E-05	7.25E-09	7.25E-09	1.12E-09	1.54E-03	5.26E-05	1.46E-06	4.37E-06	2.73E-04
Cadmium	1.36E-08	1.8E-06	6.45E-08	6.45E-08	8.10E-11	6.31E-05	2.13E-06	5.92E-08	-	1.13E-05
Cl-2-x[b]	1.00E-12	1.0E-10	1.80E-11	1.80E-11	-	3.73E-09	1.22E-10	4.00E-12	6.00E-12	7.21E-10
Cl-3-x[b]	2.00E-12	2.2E-10	2.30E-11	2.30E-11	1.10E-11	8.69E-09	2.56E-10	7.00E-12	-	2.04E-09
Cl-4-x[b]	5.00E-12	6.2E-10	2.20E-11	2.20E-11	1.00E-12	2.17E-08	7.31E-10	2.00E-11	-	3.92E-09
Cl-F-x[c]	-	5.2E-11	2.00E-12	2.00E-12	-	1.81E-09	6.10E-11	2.00E-12	5.47E-05	3.37E-10
Chromium	5.65E-07	7.9E-05	2.47E-07	2.47E-07	3.46E-09	2.74E-03	9.32E-05	2.59E-06	1.00E-12	4.86E-04
HC[d]-insoluble	-	6.0E-12	4.00E-12	4.00E-12	1.10E-11	7.68E-09	7.00E-12	-	3.13E-08	5.91E-10
HC-soluble	7.91E-04	1.1E-01	3.62E-06	3.62E-06	5.93E-05	3.90E+00	1.31E-01	3.65E-03	1.77E-09	6.85E-01
Mercury	3.07E-10	4.0E-08	1.67E-09	1.67E-09	7.90E-09	5.17E-06	4.78E-08	1.33E-09	3.28E-05	6.65E-07
Lead	1.64E-07	2.2E-05	4.71E-07	4.71E-07	1.23E-09	7.77E-04	2.63E-05	7.31E-07	2.98E-10	1.39E-04
Selenium	8.69E-09	1.2E-06	3.63E-09	3.63E-09	1.21E-09	4.27E-05	1.43E-06	3.99E-08	-	7.53E-06

TABLE A.9 (Cont.)

Contaminant	Annual Releases to Water (unit as indicated)										
	LANL	LEHR	LLNL	NTS	ORR	Pantex	PGDP	PORTS	RFETS	RMI	SRS
Radionuclide (Ci/yr)											
H-3	5.34E-02	1.17E-06	1.08E+00	1.7E-03	3.50E-03	3.44E-02	-	1.25E-03	-	-	4.77E-03
Fe-55	9.73E-07	-	-	-	-	6.27E-07	-	1.20E-05	-	-	3.27E-06
Co-60	7.74E-06	1.18E-07	3.05E-10	1.7E-04	3.55E-04	4.99E-06	-	9.20E-05	-	-	3.12E-05
Ni-59	1.29E-07	1.91E-08	4.92E-11	2.8E-05	5.73E-05	8.31E-08	-	1.22E-06	-	-	1.01E-06
Ni-63	1.72E-05	2.01E-06	5.18E-09	2.9E-03	6.03E-03	1.10E-05	-	1.63E-04	-	-	1.26E-04
Sr-90	1.41E-05	3.34E-07	9.81E-05	4.4E-04	4.26E-03	3.95E-06	-	5.46E-05	-	-	4.08E-05
Y-90	1.41E-05	3.34E-07	9.81E-05	4.4E-04	4.26E-03	3.95E-06	-	5.46E-05	-	-	4.08E-05
Nb-94	1.94E-11	9.00E-10	2.33E-12	1.3E-06	2.70E-06	-	-	5.80E-08	-	-	5.00E-08
Sb-125	-	-	-	-	-	-	-	2.56E-06	-	-	6.60E-09
Tc-99	5.57E-12	4.00E-09	4.67E-10	5.2E-06	5.10E-05	-	1.47E-04	2.54E-08	2.50E-11	2.05E-09	3.92E-09
Cs-137	1.50E-05	3.78E-07	1.03E-04	5.0E-04	4.82E-03	4.20E-06	-	5.84E-05	-	-	4.34E-05
Ba-137m	5.63E-06	3.18E-07	4.77E-06	4.6E-04	9.54E-04	3.63E-06	-	5.98E-06	-	-	6.54E-06
Pm-147	5.39E-07	-	-	-	-	3.48E-07	-	6.55E-07	-	-	1.70E-07
Sm-151	5.16E-08	4.10E-09	1.06E-11	5.9E-06	1.23E-05	3.33E-08	-	5.46E-08	-	-	7.10E-08
Eu-154	6.45E-08	1.26E-09	3.25E-12	1.8E-06	3.78E-06	4.16E-08	-	7.43E-08	-	-	4.58E-08
Th-234	1.37E-11	4.35E-08	1.16E-06	6.3E-05	1.31E-04	-	1.11E-04	5.77E-06	7.69E-11	1.24E-07	8.34E-08
U-235	-	-	6.50E-13	-	-	-	8.62E-08	4.27E-09	7.00E-14	9.62E-11	-
U-238	1.37E-11	4.35E-08	1.16E-06	6.3E-05	1.31E-04	-	1.11E-04	5.77E-06	7.69E-11	1.24E-07	8.34E-08
Pu-238	2.23E-07	1.34E-08	3.45E-11	1.9E-05	4.02E-05	1.44E-07	-	2.00E-07	-	-	2.30E-07
Pu-239	-	2.16E-10	5.60E-13	3.1E-07	6.48E-07	-	-	1.95E-10	-	-	-
Pu-240	8.00E-11	3.24E-10	8.30E-13	4.7E-07	9.72E-07	-	-	2.92E-10	-	-	1.45E-07
Pu-241	1.12E-06	1.42E-08	1.14E-06	2.1E-05	4.25E-05	7.26E-07	-	1.65E-07	-	-	1.84E-07
Am-241	-	2.16E-10	5.60E-13	3.1E-07	6.48E-07	-	-	1.95E-10	-	-	-
Chemical contaminant (kg/yr)											
Cyanides	1.99E-05	2.12E-07	3.39E-09	1.0E-05	5.47E-04	1.32E-05	5.57E-06	4.53E-04	-	2.28E-06	1.95E-06
Methylene chloride	2.06E-10	3.00E-12	1.17E-09	1.0E-10	1.36E-08	1.50E-10	1.36E-10	4.97E-09	-	2.60E-11	3.30E-11
Silver	5.93E-06	7.55E-09	1.81E-05	2.0E-06	1.96E-04	4.69E-07	1.42E-06	8.72E-05	1.34E-09	1.12E-07	2.50E-07
Arsenic	9.55E-07	6.61E-09	1.87E-06	4.9E-07	3.64E-05	4.11E-07	3.08E-07	2.07E-05	1.60E-10	7.40E-08	7.97E-08
Barium	8.75E-05	4.72E-09	1.28E-05	4.5E-05	1.85E-03	2.93E-07	4.68E-06	1.62E-03	1.09E-09	8.81E-07	1.74E-07
Cadmium	3.71E-06	4.20E-08	9.61E-07	1.8E-06	1.07E-04	2.61E-06	1.14E-06	8.33E-05	7.90E-11	4.46E-07	3.96E-07
Cl-2-x	2.03E-10	1.20E-11	3.29E-09	1.0E-10	3.47E-08	7.51E-10	4.87E-10	9.35E-09	-	1.21E-10	1.45E-10
Cl-3-x	1.81E-09	1.50E-11	1.31E-07	2.2E-10	9.04E-07	9.47E-10	8.73E-09	4.80E-08	1.10E-11	1.53E-10	1.49E-09
Cl-4-x	1.30E-09	1.40E-11	7.39E-09	6.2E-10	8.44E-08	8.86E-10	8.40E-10	3.02E-08	1.00E-12	1.51E-10	2.06E-10
Cl-F-x	1.01E-10	1.00E-12	2.67E-09	5.2E-11	2.09E-08	7.50E-11	2.03E-10	2.92E-09	-	1.20E-11	3.80E-11
Chromium	1.62E-04	1.61E-07	4.01E-05	7.9E-05	3.51E-03	9.97E-06	1.28E-05	2.96E-03	3.37E-09	3.06E-06	1.94E-06
HC-insoluble	1.90E-08	3.00E-12	1.21E-07	6.0E-12	8.56E-07	1.66E-10	7.82E-09	1.15E-07	1.10E-11	2.60E-11	1.44E-09
HC-soluble	3.38E-01	2.36E-06	6.78E-01	1.1E-01	9.19E+00	1.46E-04	5.28E-02	4.72E+00	5.77E-05	2.11E-03	8.08E-03
Mercury	9.38E-06	1.09E-09	9.03E-05	4.1E-08	6.30E-04	6.75E-08	5.81E-06	6.42E-05	7.69E-09	1.14E-08	1.02E-06
Lead	4.55E-05	3.07E-07	1.43E-05	2.2E-05	1.19E-03	1.91E-05	9.59E-06	9.42E-04	1.19E-09	3.43E-06	2.97E-06
Selenium	3.72E-06	2.36E-09	1.38E-05	1.2E-06	1.46E-04	1.47E-07	1.04E-06	5.40E-05	1.18E-09	4.60E-08	1.76E-07

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.10 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 7 and Case 10a, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Charleston	Colonie	ETEC	FEMP
Radionuclide (Ci/yr)										
H-3	-	1.1E-02	7.86E-08	-	2.12E-09	2.51E-09	2.07E-01	-	1.77E-08	-
Fe-55	-	-	3.61E-08	-	-	-	6.57E-08	-	-	-
Co-60	-	5.61E-09	2.76E-07	-	3.58E-11	1.21E-08	5.03E-07	-	8.55E-08	-
Ni-59	-	9.06E-10	3.61E-09	-	5.47E-11	1.96E-09	6.57E-09	-	1.38E-08	-
Ni-63	-	9.53E-08	4.85E-07	-	5.62E-09	2.06E-07	8.83E-07	-	1.45E-06	-
Sr-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Y-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Nb-94	-	4.27E-11	1.72E-10	-	2.43E-12	9.22E-11	3.13E-10	-	6.51E-10	-
Sb-125	-	-	7.64E-11	-	-	-	1.39E-10	-	-	-
Tc-99	4.00E-14	1.71E-10	-	-	1.27E-11	3.68E-10	-	1.70E-12	2.60E-09	2.89E-10
Cs-137	-	1.61E-08	1.80E-08	-	2.84E-08	3.48E-08	3.26E-08	-	2.46E-07	-
Ba-137m	-	1.51E-08	1.71E-08	-	2.65E-08	3.26E-08	3.11E-08	-	2.30E-07	-
Pm-147	-	-	1.97E-09	-	-	-	3.58E-09	-	-	-
Sm-151	-	1.94E-10	1.53E-10	-	4.09E-10	4.20E-10	2.78E-10	-	2.96E-09	-
Eu-154	-	5.97E-11	2.20E-10	-	4.27E-11	1.29E-10	4.00E-10	-	9.11E-10	-
Th-234[a]	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	3.15E-08	1.92E-08
U-235	-	-	-	-	-	-	-	8.90E-14	-	1.49E-11
U-238	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	3.15E-08	1.92E-08
Pu-238	-	6.34E-10	5.63E-10	-	1.27E-09	1.37E-09	1.03E-09	-	9.67E-09	-
Pu-239	-	1.02E-11	-	-	1.72E-11	2.21E-11	-	-	1.56E-10	-
Pu-240	-	1.54E-11	-	-	9.81E-12	3.32E-11	-	-	2.34E-10	-
Pu-241	-	6.72E-10	4.58E-10	-	2.82E-10	1.45E-09	8.34E-10	-	1.02E-08	-
Am-241	-	1.02E-11	-	-	2.41E-11	2.21E-11	-	-	1.56E-10	-
Chemical contaminant (kg/yr)										
Cyanides	8.09E-12	4.0E-09	5.50E-10	-	1.70E-11	1.70E-08	5.79E-10	5.63E-10	4.29E-10	1.01E-07
Methylene chloride	3.07E-09	5.3E-05	1.74E-06	3.96E-07	1.22E-06	2.03E-05	7.46E-06	7.26E-06	1.47E-06	5.06E-04
Silver	8.87E-12	8.0E-09	5.86E-10	-	2.80E-10	3.43E-08	1.02E-09	9.85E-10	5.73E-08	1.75E-07
Arsenic	1.60E-12	2.6E-09	2.52E-10	-	8.91E-11	1.19E-08	1.88E-10	1.78E-10	2.86E-08	6.40E-08
Barium	1.40E-10	1.9E-07	3.26E-08	-	2.78E-09	9.30E-07	2.47E-09	1.02E-09	1.11E-07	5.35E-06
Cadmium	8.55E-12	6.3E-09	1.75E-09	-	3.65E-09	5.76E-08	2.43E-08	2.42E-08	1.90E-08	1.33E-06
Cl-2-x[b]	3.88E-09	2.7E-05	1.81E-06	1.98E-07	1.02E-06	1.63E-05	4.84E-06	4.61E-06	1.52E-06	3.67E-04
Cl-3-x[b]	8.43E-09	2.9E-04	4.24E-05	1.98E-06	9.61E-06	9.43E-04	4.38E-04	4.36E-04	6.04E-05	2.15E-02
Cl-4-x[b]	1.84E-08	2.0E-04	9.13E-06	1.58E-06	5.21E-06	1.49E-04	9.22E-05	9.15E-05	1.87E-05	7.34E-03
Cl-F-x[c]	1.54E-09	3.6E-06	1.35E-06	-	8.73E-07	1.19E-05	1.14E-06	8.61E-07	9.76E-07	1.42E-04
Chromium	2.52E-10	2.4E-07	3.40E-08	-	4.20E-09	1.20E-06	2.46E-08	2.35E-08	1.42E-07	8.67E-06
HC[d]-insoluble	3.95E-10	8.1E-04	1.35E-04	4.94E-06	2.97E-04	2.48E-03	8.80E-04	8.71E-04	1.65E-04	5.57E-02
HC-soluble	9.72E-06	1.8E-03	6.53E-05	2.37E-06	1.13E-04	2.66E-03	1.32E-03	1.32E-03	9.98E-05	7.87E-02
Mercury	2.56E-12	6.9E-08	3.24E-09	-	6.67E-10	3.77E-07	5.90E-09	5.77E-09	3.17E-08	1.55E-06
Lead	7.58E-11	3.1E-07	7.25E-08	-	3.89E-09	1.26E-06	8.10E-09	5.78E-09	2.84E-07	5.87E-06
Selenium	3.84E-12	2.9E-08	9.17E-10	-	1.03E-10	1.59E-07	9.03E-10	8.62E-10	9.42E-09	6.11E-07

TABLE A.10 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	GA	GJPO	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	KCP	LANL
Radionuclide (Ci/yr)										
H-3	-	-	7.24E+03	1.38E+02	1.17E-08	5.55E-07	5.83E-07	1.76E-07	5.59E-09	1.38E+02
Fe-55	-	-	1.95E-04	9.90E-04	1.02E-11	2.55E-07	2.68E-07	8.07E-08	2.56E-09	3.21E-06
Co-60	-	-	1.52E-03	7.60E-03	8.08E-11	1.95E-06	2.05E-06	6.17E-07	1.96E-08	3.51E-05
Ni-59	-	-	5.67E-05	1.02E-04	1.35E-12	2.55E-08	2.68E-08	8.07E-09	2.56E-10	1.46E-06
Ni-63	-	-	6.44E-03	1.36E-02	1.79E-10	3.42E-06	3.60E-06	1.08E-06	3.45E-08	1.82E-04
Sr-90	-	-	1.72E-02	5.12E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	2.38E-05
Y-90	-	-	1.72E-02	5.12E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	2.38E-05
Nb-94	-	-	2.58E-06	4.86E-06	-	1.21E-09	1.27E-09	3.84E-10	1.22E-11	5.42E-08
Sb-125	-	-	-	2.10E-06	-	5.39E-10	5.66E-10	1.71E-10	5.43E-12	7.57E-11
Tc-99	5.08E-12	1.84E-13	8.59E-06	5.77E-07	-	-	-	-	-	3.18E-09
Cs-137	-	-	4.13E-07	5.47E-04	6.12E-11	1.27E-07	1.34E-07	4.03E-08	1.28E-09	2.54E-05
Ba-137m	-	-	1.93E-02	5.20E-04	5.88E-11	1.21E-07	1.27E-07	3.82E-08	1.21E-09	2.49E-05
Pm-147	-	-	1.81E-02	5.40E-05	5.63E-12	1.39E-08	1.46E-08	4.40E-09	1.40E-10	1.64E-06
Sm-151	-	-	1.06E-05	4.85E-06	5.39E-13	1.08E-09	1.13E-09	3.41E-10	1.09E-11	2.46E-07
Eu-154	-	-	2.78E-04	6.23E-06	6.74E-13	1.55E-09	1.63E-09	4.91E-10	1.56E-11	2.37E-07
Th-234	3.39E-10	1.23E-11	3.02E-05	2.56E-05	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11	3.90E-08
U-235	2.64E-13	1.00E-14	1.81E-05	1.52E-11	-	-	-	-	-	1.32E-13
U-238	3.39E-10	1.23E-11	1.81E-05	2.56E-05	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11	3.90E-08
Pu-238	-	-	8.65E-04	1.76E-05	2.33E-12	3.97E-09	4.18E-09	1.26E-09	4.00E-11	9.56E-07
Pu-239	-	-	1.17E-05	3.46E-08	-	-	-	-	-	-
Pu-240	-	-	6.66E-06	5.19E-08	-	-	-	-	-	2.23E-07
Pu-241	-	-	1.97E-04	1.48E-05	1.18E-11	3.23E-09	3.40E-09	1.02E-09	3.26E-11	3.64E-06
Am-241	-	-	1.64E-05	3.46E-08	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	2.23E-09	4.24E-11	2.35E-08	7.99E-09	1.81E-10	4.76E-10	1.51E-09	8.31E-10		2.62E-09
Methylene chloride	2.30E-06	1.29E-07	7.27E-02	1.20E-03	-	3.11E-05	2.64E-05	4.36E-06	2.98E-07	1.88E-03
Silver	2.26E-09	6.84E-11	5.79E-04	2.49E-05	1.91E-10	3.32E-09	4.26E-09	1.17E-09	6.47E-12	8.56E-06
Arsenic	6.86E-10	2.24E-11	1.32E-05	8.18E-07	-	1.10E-09	1.52E-09	3.91E-10	1.27E-12	6.43E-08
Barium	7.36E-08	8.03E-10	1.28E-02	4.31E-04	-	2.25E-08	7.20E-08	4.46E-08	2.59E-10	3.47E-04
Cadmium	2.86E-09	4.14E-10	1.37E-03	1.31E-04	2.12E-11	1.88E-08	1.59E-08	2.35E-09	2.25E-10	2.38E-05
Cl-2-x	2.13E-06	8.69E-08	3.86E-02	5.76E-04	-	1.80E-05	1.54E-05	3.57E-06	1.75E-07	8.05E-04
Cl-3-x	3.97E-05	6.92E-06	4.57E-01	1.07E-02	8.06E-07	4.51E-04	3.55E-04	5.03E-05	7.23E-07	7.78E-03
Cl-4-x	9.98E-06	1.52E-06	2.92E-01	2.87E-03	4.53E-08	1.69E-04	1.73E-04	2.69E-05	3.89E-07	3.87E-03
Cl-F-x	1.26E-06	2.22E-08	2.81E-03	5.10E-04	-	4.74E-06	2.57E-06	2.39E-06	2.37E-07	7.09E-04
Chromium	9.75E-08	1.67E-09	1.58E-02	6.19E-04	9.10E-10	3.72E-08	9.22E-08	4.52E-08	1.13E-09	1.44E-04
HC-insoluble	1.09E-04	1.41E-05	1.27E+00	3.34E-02	1.11E-05	9.90E-04	7.65E-04	1.11E-04	1.52E-06	1.01E-02
HC-soluble	1.79E-03	6.18E-05	3.22E+00	1.45E-01	3.63E-04	9.47E-04	7.51E-04	9.92E-05	1.62E-09	5.01E-02
Mercury	9.17E-09	1.33E-10	2.76E-04	6.64E-06	1.21E-09	6.27E-09	8.99E-09	2.99E-09	1.88E-10	5.25E-06
Lead	1.32E-07	6.29E-10	1.90E-02	6.80E-04	2.17E-10	3.50E-08	1.82E-07	1.03E-07	7.52E-09	1.92E-04
Selenium	3.79E-09	4.89E-11	1.68E-03	3.89E-05	1.73E-10	1.28E-09	2.05E-09	8.27E-10	1.68E-11	6.21E-06

TABLE A.10 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	LBL	LEHR	LLNL	Mare Is	Norfolk	NTS	ORR	Pantex	Pearl H	PGDP
Radionuclide (Ci/yr)										
H-3	9.30E-06	2.44E-04	3.44E-04	4.83E-07	4.71E-08	3.5E-01	1.26E+01	7.20E+00	3.95E-08	-
Fe-55	-	-	-	2.22E-07	2.16E-08	-	8.46E-06	4.40E-09	1.81E-08	-
Co-60	-	4.69E-10	-	1.70E-06	1.66E-07	2.6E-07	9.25E-04	3.50E-08	1.39E-07	-
Ni-59	-	7.57E-11	-	2.22E-08	2.16E-09	4.2E-08	1.40E-04	5.83E-10	1.81E-09	-
Ni-63	-	7.96E-09	-	2.98E-06	2.91E-07	4.4E-06	1.47E-02	7.73E-08	2.44E-07	-
Sr-90	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	1.99E-03	2.47E-08	8.53E-09	-
Y-90	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	1.99E-03	2.47E-08	8.53E-09	-
Nb-94	-	3.57E-12	-	1.06E-09	1.03E-10	2.0E-09	6.58E-06	-	8.63E-11	-
Sb-125	-	-	-	4.69E-10	4.58E-11	-	1.79E-08	-	3.83E-11	-
Tc-99	-	1.41E-11	-	-	-	7.8E-09	7.31E-05	-	-	3.77E-07
Cs-137	2.05E-09	1.33E-09	7.57E-08	1.11E-07	1.08E-08	7.4E-07	2.25E-03	2.63E-08	9.06E-09	-
Ba-137m	1.95E-09	1.26E-09	7.23E-08	1.05E-07	1.02E-08	6.9E-07	2.32E-03	2.54E-08	8.58E-09	-
Pm-147	-	-	-	1.21E-08	1.18E-09	-	4.61E-07	2.44E-09	9.87E-10	-
Sm-151	-	1.63E-11	-	9.38E-10	9.16E-11	8.9E-09	2.98E-05	2.33E-10	7.67E-11	-
Eu-154	-	4.99E-12	-	1.35E-09	1.32E-10	2.7E-09	9.21E-06	2.91E-10	1.10E-10	-
Th-234	4.75E-10	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	5.02E-04	-	3.40E-10	1.26E-06
U-235	-	-	-	-	-	-	1.44E-07	-	-	9.74E-10
U-238	-	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	5.02E-04	-	3.40E-10	1.26E-06
Pu-238	4.75E-10	5.30E-11	-	3.46E-09	3.38E-10	2.9E-08	9.74E-05	1.01E-09	2.83E-10	-
Pu-239	-	8.56E-13	-	-	-	4.7E-10	1.57E-06	-	-	-
Pu-240	-	1.28E-12	-	-	-	7.1E-10	2.35E-06	-	-	-
Pu-241	4.65E-10	5.62E-11	1.72E-08	2.82E-09	2.75E-10	3.1E-08	1.03E-04	5.09E-09	2.30E-10	-
Am-241	-	8.56E-13	-	-	-	4.7E-10	1.57E-06	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	5.50E-09	3.35E-11	1.53E-07	-	-	7.2E-08	9.16E-08	4.12E-09	4.07E-11	1.54E-08
Methylene chloride	1.15E-04	1.49E-06	1.44E-04	5.54E-06	1.04E-06	3.4E-05	1.63E-02	3.78E-04	5.86E-07	4.38E-04
Silver	6.52E-09	1.19E-10	3.20E-07	6.27E-10	1.69E-10	2.1E-07	1.42E-03	8.84E-09	1.19E-10	2.08E-08
Arsenic	1.49E-09	5.14E-12	8.01E-08	3.09E-10	1.17E-10	8.7E-08	4.26E-05	1.94E-09	6.99E-11	8.92E-09
Barium	2.79E-07	1.66E-09	4.85E-06	1.04E-07	4.77E-09	3.0E-06	3.43E-02	4.51E-07	4.47E-09	5.55E-07
Cadmium	1.54E-08	5.47E-10	1.25E-07	4.95E-09	1.70E-09	1.0E-07	5.92E-03	1.70E-07	1.06E-09	1.46E-06
Cl-2-x	6.06E-05	1.61E-06	2.28E-04	5.98E-06	1.11E-06	3.4E-05	1.20E-02	2.43E-04	6.23E-07	2.45E-04
Cl-3-x	5.67E-04	8.63E-06	7.99E-03	1.19E-04	4.10E-05	6.1E-04	8.01E-01	4.10E-03	2.12E-05	2.46E-02
Cl-4-x	4.37E-04	2.89E-05	6.54E-04	2.65E-05	8.00E-06	1.3E-04	1.52E-01	1.63E-03	4.44E-06	5.43E-03
Cl-F-x	3.24E-06	1.40E-06	1.80E-04	6.89E-06	9.36E-07	3.0E-05	6.57E-03	1.64E-04	6.46E-07	2.44E-05
Chromium	2.91E-07	4.20E-10	5.79E-06	3.19E-08	6.40E-09	3.8E-06	4.28E-02	5.34E-07	3.36E-08	1.83E-06
HC-insoluble	2.68E-03	2.20E-05	1.25E-02	4.05E-04	1.38E-04	2.6E-03	1.63E+00	5.42E-03	6.91E-05	5.13E-02
HC-soluble	1.07E-03	1.01E-05	1.47E-01	1.73E-04	6.57E-05	4.6E-02	5.31E+00	1.98E-03	3.29E-05	2.68E-02
Mercury	1.40E-08	2.78E-10	2.68E-06	2.22E-08	1.91E-09	9.1E-07	1.13E-03	8.21E-08	1.14E-09	1.39E-07
Lead	6.99E-07	8.57E-10	6.71E-06	1.96E-08	3.10E-09	3.7E-06	4.79E-02	2.25E-06	6.73E-09	1.49E-06
Selenium	4.18E-09	2.45E-11	9.04E-07	1.43E-09	5.17E-10	4.0E-07	5.43E-03	1.06E-08	2.93E-10	3.76E-08

TABLE A.10 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)								
	PORTS	Ports Nav	PPPL	Puget So	RFETS	RMI	SNL-CA	SNL-NM	SRS
Radionuclide (Ci/yr)									
H-3	2.21E+01	6.89E-09	1.48E-09	8.78E-07	1.11E-01	3.92E-12	4.80E-09	2.73E-07	1.26E+03
Fe-55	2.08E-04	3.16E-09	3.10E-13	4.03E-07	1.70E-06	2.66E-10	4.80E-09	4.29E-10	4.66E-05
Co-60	1.72E-03	2.42E-08	3.10E-13	3.08E-06	1.30E-05	2.07E-13	5.03E-09	2.15E-08	1.15E-03
Ni-59	4.07E-05	3.16E-10	3.25E-13	4.03E-08	1.70E-07	2.66E-10	4.80E-09	2.03E-09	9.09E-05
Ni-63	4.89E-03	4.25E-08	3.10E-13	5.42E-06	2.28E-05	-	1.17E-09	2.45E-07	1.10E-02
Sr-90	4.17E-04	1.49E-09	7.50E-14	1.90E-07	7.99E-07	-	1.17E-09	1.46E-08	6.43E-04
Y-90	4.17E-04	1.49E-09	7.50E-14	1.90E-07	7.99E-07	-	1.14E-09	1.46E-08	6.43E-04
Nb-94	1.93E-06	1.51E-11	7.40E-14	1.92E-09	8.07E-09	-	-	1.03E-10	4.59E-06
Sb-125	4.59E-06	6.69E-12	-	8.53E-10	1.90E-11	-	-	6.04E-12	2.62E-07
Tc-99	4.41E-07	1.58E-09	-	2.01E-07	3.59E-09	-	-	1.56E-08	5.91E-08
Cs-137	4.65E-04	1.50E-09	-	1.91E-07	8.48E-07	-	-	1.48E-08	6.91E-04
Ba-137m	4.38E-04	1.72E-10	-	2.20E-08	8.03E-07	-	-	1.69E-10	6.56E-04
Pm-147	1.13E-05	1.34E-11	-	1.71E-09	9.24E-08	-	-	7.85E-11	1.52E-06
Sm-151	5.29E-06	1.92E-11	-	2.45E-09	7.18E-09	-	-	7.25E-11	7.46E-06
Eu-154	2.59E-06	5.94E-11	-	7.57E-09	1.03E-08	-	-	7.25E-11	3.58E-06
Th-234	5.55E-05	5.94E-11	-	7.57E-09	3.32E-08	-	-	5.32E-10	3.67E-06
U-235	4.95E-09	4.93E-11	-	6.29E-09	1.07E-12	-	-	4.23E-10	3.67E-06
U-238	5.55E-05	4.01E-11	-	5.12E-09	3.32E-08	-	-	4.23E-10	2.35E-05
Pu-238	1.76E-05	-	-	-	2.65E-08	-	-	2.28E-05	1.84E-05
Pu-239	2.31E-07	-	-	-	2.15E-08	-	-	-	1.87E-05
Pu-240	3.40E-07	-	-	-	-	-	-	-	-
Pu-241	1.75E-05	-	-	-	-	-	-	-	-
Am-241	2.33E-07	-	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	9.57E-08	-	-	7.31E-09	1.16E-13	3.25E-10	6.92E-11	2.63E-09	1.02E-09
Methylene chloride	8.61E-03	1.32E-07	1.44E-07	1.38E-05	3.10E-06	1.76E-05	1.46E-04	7.75E-06	1.21E-02
Silver	3.77E-04	2.83E-11	-	5.84E-09	1.58E-08	3.42E-10	4.36E-10	2.32E-09	1.26E-04
Arsenic	1.82E-06	2.35E-11	-	1.85E-09	3.12E-11	1.39E-10	2.73E-09	6.65E-10	3.98E-06
Barium	1.19E-02	7.35E-10	-	3.81E-07	2.51E-07	2.51E-08	2.48E-08	1.46E-07	3.75E-03
Cadmium	6.01E-04	3.63E-10	-	8.12E-09	5.99E-08	4.71E-08	3.51E-07	4.10E-10	4.14E-03
Cl-2-x	7.18E-03	1.32E-07	7.19E-08	1.40E-05	1.15E-06	1.13E-05	7.49E-05	8.42E-06	5.99E-03
Cl-3-x	8.07E-02	7.91E-06	7.19E-07	1.18E-04	1.25E-05	1.15E-03	1.00E-03	2.82E-05	4.85E-01
Cl-4-x	2.46E-02	1.48E-06	5.75E-07	4.61E-05	4.62E-06	2.58E-04	4.27E-04	1.50E-05	1.08E-01
Cl-F-x	4.48E-03	7.50E-08	-	1.39E-05	1.37E-06	3.95E-06	6.83E-07	9.07E-06	2.24E-03
Chromium	1.30E-02	4.52E-09	-	9.60E-07	1.25E-07	5.29E-08	3.20E-07	1.34E-07	7.57E-03
HC-insoluble	2.13E-01	2.63E-05	1.80E-06	6.87E-05	1.72E-05	3.07E-04	3.36E-02	7.69E-05	1.03E+00
HC-soluble	1.31E+00	1.31E-05	8.63E-07	6.52E-06	3.16E-05	1.82E-04	1.09E-02	2.64E-06	7.44E-01
Mercury	4.18E-05	3.89E-10	-	1.99E-08	8.42E-10	1.42E-09	7.30E-09	6.73E-09	1.02E-04
Lead	2.09E-02	5.67E-10	-	9.29E-07	1.48E-07	1.42E-08	7.76E-08	3.36E-07	5.81E-03
Selenium	1.12E-03	1.02E-10	-	5.63E-09	8.88E-09	2.83E-10	1.69E-09	2.09E-09	5.90E-04

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.11 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 7 and Case 10a, Non-PCBs

Contaminant	Annual Release to Water (unit as indicated)									
	Ames	ANL-E	Charleston	Colonie	FEMP	GA	GJPO	Hanford	INEL	LANL
Radionuclide (Ci/yr)										
H-3	-	5.2E-05	9.89E-04	-	-	-	-	1.09E+00	1.80E-01	5.34E-02
Fe-55	-	-	9.53E-06	-	-	-	-	9.99E-09	1.74E-03	9.73E-07
Co-60	-	5.3E-06	7.29E-05	-	-	-	-	2.84E-06	1.33E-02	7.74E-06
Ni-59	-	8.5E-07	9.53E-07	-	-	-	-	4.23E-06	1.74E-04	1.29E-07
Ni-63	-	9.0E-05	1.28E-04	-	-	-	-	4.35E-04	2.34E-02	1.72E-05
Sr-90	-	1.3E-05	4.99E-06	-	-	-	-	5.80E-03	8.49E-04	1.41E-05
Y-90	-	1.3E-05	4.99E-06	-	-	-	-	5.80E-03	8.49E-04	1.41E-05
Nb-94	-	4.0E-08	4.54E-08	-	-	-	-	1.87E-07	8.29E-06	1.94E-11
Sb-125	-	-	2.02E-08	-	-	-	-	2.11E-11	3.68E-06	-
Tc-99	5.94E-11	1.6E-07	-	2.98E-10	2.74E-07	9.26E-09	2.58E-10	2.87E-06	7.95E-10	5.57E-12
Cs-137	-	1.5E-05	5.30E-06	-	-	-	-	6.51E-03	9.01E-04	1.50E-05
Ba-137m	-	1.4E-05	4.52E-06	-	-	-	-	2.06E-03	8.24E-04	5.63E-06
Pm-147	-	-	5.20E-07	-	-	-	-	5.44E-10	9.48E-05	5.39E-07
Sm-151	-	1.8E-07	4.04E-08	-	-	-	-	3.16E-05	7.37E-06	5.16E-08
Eu-154	-	5.6E-08	5.80E-08	-	-	-	-	3.30E-06	1.06E-05	6.45E-08
Th-234[a]	3.90E-09	1.9E-06	1.79E-07	1.78E-08	1.81E-05	6.11E-07	1.70E-08	2.37E-06	3.27E-05	1.37E-11
U-235	3.03E-12	-	-	1.39E-11	1.41E-08	4.75E-10	1.32E-11	-	6.50E-13	-
U-238	3.90E-09	1.9E-06	1.79E-07	1.78E-08	1.81E-05	6.11E-07	1.70E-08	2.37E-06	3.27E-05	1.37E-11
Pu-238	-	6.0E-07	1.49E-07	-	-	-	-	9.81E-05	2.72E-05	2.23E-07
Pu-239	-	9.6E-09	-	-	-	-	-	1.33E-06	1.47E-12	-
Pu-240	-	1.5E-08	-	-	-	-	-	7.58E-07	2.20E-12	8.00E-11
Pu-241	-	6.3E-07	1.21E-07	-	-	-	-	2.29E-05	2.21E-05	1.12E-06
Am-241	-	9.6E-09	-	-	-	-	-	1.86E-06	1.47E-12	-
Chemical contaminant (kg/yr)										
Cyanides	7.59E-08	1.0E-05	3.26E-07	3.26E-07	3.53E-04	1.19E-05	3.32E-07	3.39E-09	6.34E-05	1.99E-05
Methylene chloride	1.00E-12	1.0E-10	4.00E-12	4.00E-12	3.61E-09	1.22E-10	4.00E-12	2.54E-09	6.53E-10	2.06E-10
Silver	1.46E-08	2.0E-06	1.16E-08	1.16E-08	7.03E-05	2.39E-06	6.65E-08	2.92E-04	1.26E-05	5.93E-06
Arsenic	3.58E-09	4.9E-07	1.02E-08	1.02E-08	1.69E-05	5.73E-07	1.60E-08	1.87E-06	3.03E-06	9.55E-07
Barium	3.17E-07	4.5E-05	7.25E-09	7.25E-09	1.54E-03	5.26E-05	1.46E-06	1.28E-05	2.73E-04	8.75E-05
Cadmium	1.36E-08	1.8E-06	6.45E-08	6.45E-08	6.29E-05	2.13E-06	5.92E-08	5.33E-06	1.13E-05	3.71E-06
Cl-2-x[b]	1.00E-12	1.0E-10	1.80E-11	1.80E-11	3.72E-09	1.22E-10	4.00E-12	3.29E-09	7.24E-10	2.03E-10
Cl-3-x[b]	2.00E-12	2.2E-10	2.30E-11	2.30E-11	7.69E-09	2.56E-10	7.00E-12	1.31E-07	2.17E-09	1.81E-09
Cl-4-x[b]	5.00E-12	6.2E-10	2.20E-11	2.20E-11	2.16E-08	7.31E-10	2.00E-11	7.38E-09	3.93E-09	1.30E-09
Cl-F-x[c]	-	5.2E-11	2.00E-12	2.00E-12	1.80E-09	6.10E-11	2.00E-12	2.67E-09	3.40E-10	1.01E-10
Chromium	5.65E-07	7.9E-05	2.47E-07	2.47E-07	2.74E-03	9.32E-05	2.59E-06	9.47E-05	4.86E-04	1.62E-04
HC[d]-insoluble	-	6.0E-12	4.00E-12	4.00E-12	2.45E-10	7.00E-12	-	1.21E-07	7.12E-10	1.90E-08
HC-soluble	7.91E-04	1.1E-01	3.62E-06	3.62E-06	3.85E+00	1.31E-01	3.65E-03	6.77E-01	6.86E-01	3.38E-01
Mercury	3.07E-10	4.0E-08	1.67E-09	1.67E-09	1.42E-06	4.78E-08	1.33E-09	9.02E-05	7.55E-07	9.38E-06
Lead	1.64E-07	2.2E-05	4.71E-07	4.71E-07	7.75E-04	2.63E-05	7.31E-07	4.71E-05	1.39E-04	4.55E-05
Selenium	8.69E-09	1.2E-06	3.63E-09	3.63E-09	4.21E-05	1.43E-06	3.99E-08	1.38E-05	7.55E-06	3.72E-06

TABLE A.11 (Cont.)

Contaminant	Annual Release to Water (unit as indicated)								
	LEHR	NTS	ORR	Pantex	PGDP	PORTS	RFETS	RMI	SRS
Radionuclide (Ci/yr)									
H-3	1.17E-06	1.7E-03	3.50E-03	3.44E-02	-	1.26E-03	-	-	4.77E-03
Fe-55	-	-	-	6.27E-07	-	1.20E-05	-	-	3.27E-06
Co-60	1.18E-07	1.7E-04	3.55E-04	4.99E-06	-	9.32E-05	-	-	3.12E-05
Ni-59	1.91E-08	2.8E-05	5.73E-05	8.31E-08	-	1.40E-06	-	-	1.01E-06
Ni-63	2.01E-06	2.9E-03	6.03E-03	1.10E-05	-	1.83E-04	-	-	1.26E-04
Sr-90	3.34E-07	4.4E-04	4.26E-03	3.95E-06	-	6.32E-05	-	-	4.08E-05
Y-90	3.34E-07	4.4E-04	4.26E-03	3.95E-06	-	6.32E-05	-	-	4.08E-05
Nb-94	9.00E-10	1.3E-06	2.70E-06	-	-	6.68E-08	-	-	5.00E-08
Sb-125	-	-	-	-	-	2.54E-08	-	-	6.60E-09
Tc-99	4.00E-09	5.2E-06	1.67E-04	-	3.06E-05	2.67E-06	2.50E-11	2.05E-09	3.92E-09
Cs-137	3.78E-07	5.0E-04	4.82E-03	4.20E-06	-	6.80E-05	-	-	4.34E-05
Ba-137m	3.18E-07	4.6E-04	9.54E-04	3.63E-06	-	9.06E-06	-	-	6.54E-06
Pm-147	-	-	-	3.48E-07	-	6.55E-07	-	-	1.70E-07
Sm-151	4.10E-09	5.9E-06	1.23E-05	3.33E-08	-	9.43E-08	-	-	7.10E-08
Eu-154	1.26E-09	1.8E-06	3.78E-06	4.16E-08	-	8.65E-08	-	-	4.58E-08
Th-234	4.35E-08	6.3E-05	1.49E-04	-	9.28E-05	6.22E-06	7.69E-11	1.24E-07	8.34E-08
U-235	-	-	1.42E-08	-	7.20E-08	4.29E-09	7.00E-14	9.62E-11	-
U-238	4.35E-08	6.3E-05	1.49E-04	-	9.28E-05	6.22E-06	7.69E-11	1.24E-07	8.34E-08
Pu-238	1.34E-08	1.9E-05	4.02E-05	1.44E-07	-	3.29E-07	-	-	2.30E-07
Pu-239	2.16E-10	3.1E-07	6.48E-07	-	-	2.29E-09	-	-	-
Pu-240	3.24E-10	4.7E-07	9.72E-07	-	-	3.43E-09	-	-	1.45E-07
Pu-241	1.42E-08	2.1E-05	4.25E-05	7.26E-07	-	3.03E-07	-	-	1.84E-07
Am-241	2.16E-10	3.1E-07	6.48E-07	-	-	2.29E-09	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	2.12E-07	1.0E-05	5.47E-04	1.32E-05	5.56E-06	4.53E-04	-	2.28E-06	1.95E-06
Methylene chloride	3.00E-12	1.0E-10	1.37E-08	1.50E-10	6.20E-11	5.00E-09	-	2.60E-11	3.30E-11
Silver	7.55E-09	2.0E-06	1.97E-04	4.69E-07	3.38E-07	9.30E-05	1.34E-09	1.12E-07	2.50E-07
Arsenic	6.61E-09	4.9E-07	3.65E-05	4.11E-07	1.88E-07	2.07E-05	1.60E-10	7.40E-08	7.97E-08
Barium	4.72E-09	4.5E-05	1.85E-03	2.93E-07	3.86E-06	1.62E-03	1.09E-09	8.81E-07	1.74E-07
Cadmium	4.20E-08	1.8E-06	1.07E-04	2.61E-06	1.08E-06	8.34E-05	7.90E-11	4.46E-07	3.96E-07
Cl-2-x	1.20E-11	1.0E-10	3.49E-08	7.51E-10	2.76E-10	9.37E-09	0.00E+00	1.21E-10	1.45E-10
Cl-3-x	1.50E-11	2.2E-10	9.12E-07	9.47E-10	3.57E-10	4.90E-08	1.10E-11	1.53E-10	1.49E-09
Cl-4-x	1.40E-11	6.2E-10	8.48E-08	8.86E-10	3.68E-10	3.02E-08	1.00E-12	1.51E-10	2.06E-10
Cl-F-x	1.00E-12	5.2E-11	2.11E-08	7.50E-11	3.20E-11	2.93E-09	0.00E+00	1.20E-11	3.80E-11
Chromium	1.61E-07	7.9E-05	3.51E-03	9.97E-06	1.02E-05	2.97E-03	3.37E-09	3.06E-06	1.94E-06
HC-insoluble	3.00E-12	6.0E-12	8.64E-07	1.66E-10	6.00E-11	1.23E-07	1.10E-11	2.60E-11	1.44E-09
HC-soluble	2.36E-06	1.1E-01	9.24E+00	1.46E-04	9.42E-03	4.77E+00	5.77E-05	2.11E-03	8.08E-03
Mercury	1.09E-09	4.1E-08	6.35E-04	6.75E-08	2.75E-08	6.80E-05	7.69E-09	1.14E-08	1.02E-06
Lead	3.07E-07	2.2E-05	1.19E-03	1.91E-05	8.68E-06	9.43E-04	1.19E-09	3.43E-06	2.97E-06
Selenium	2.36E-09	1.2E-06	1.46E-04	1.47E-07	1.55E-07	5.46E-05	1.18E-09	4.60E-08	1.76E-07

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.12 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 15, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Charleston	Colonie	ETEC	FEMP
Radionuclide (Ci/yr)										
H-3	-	1.1E-02	7.86E-08	-	2.12E-09	2.51E-09	2.07E-01	-	1.77E-08	-
Fe-55	-	-	3.61E-08	-	-	-	6.57E-08	-	-	-
Co-60	-	5.61E-09	2.76E-07	-	3.58E-11	1.21E-08	5.03E-07	-	8.55E-08	-
Ni-59	-	9.06E-10	3.61E-09	-	5.47E-11	1.96E-09	6.57E-09	-	1.38E-08	-
Ni-63	-	9.53E-08	4.85E-07	-	5.62E-09	2.06E-07	8.83E-07	-	1.45E-06	-
Sr-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Y-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Nb-94	-	4.27E-11	1.72E-10	-	2.43E-12	9.22E-11	3.13E-10	-	6.51E-10	-
Sb-125	-	-	7.64E-11	-	-	-	1.39E-10	-	-	-
Tc-99	4.00E-14	1.71E-10	-	-	1.27E-11	3.68E-10	-	1.70E-12	2.60E-09	2.89E-10
Cs-137	-	1.61E-08	1.80E-08	-	2.84E-08	3.48E-08	3.26E-08	-	2.46E-07	-
Ba-137m	-	1.51E-08	1.71E-08	-	2.65E-08	3.26E-08	3.11E-08	-	2.30E-07	-
Pm-147	-	-	1.97E-09	-	-	-	3.58E-09	-	-	-
Sm-151	-	1.94E-10	1.53E-10	-	4.09E-10	4.20E-10	2.78E-10	-	2.96E-09	-
Eu-154	-	5.97E-11	2.20E-10	-	4.27E-11	1.29E-10	4.00E-10	-	9.11E-10	-
Th-234[a]	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	3.15E-08	1.92E-08
U-235	-	-	-	-	-	-	-	8.90E-14	-	1.49E-11
U-238	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	3.15E-08	1.92E-08
Pu-238	-	6.34E-10	5.63E-10	-	1.27E-09	1.37E-09	1.03E-09	-	9.67E-09	-
Pu-239	-	1.02E-11	-	-	1.72E-11	2.21E-11	-	-	1.56E-10	-
Pu-240	-	1.54E-11	-	-	9.81E-12	3.32E-11	-	-	2.34E-10	-
Pu-241	-	6.72E-10	4.58E-10	-	2.82E-10	1.45E-09	8.34E-10	-	1.02E-08	-
Am-241	-	1.02E-11	-	-	2.41E-11	2.21E-11	-	-	1.56E-10	-
Chemical contaminant (kg/yr)										
Cyanides	8.09E-12	4.0E-09	5.50E-10	-	1.70E-11	1.70E-08	5.79E-10	5.63E-10	4.29E-10	1.01E-07
Methylene chloride	3.07E-09	5.3E-05	1.74E-06	3.96E-07	1.22E-06	2.03E-05	7.46E-06	7.26E-06	1.47E-06	5.06E-04
Silver	8.87E-12	8.0E-09	5.86E-10	-	2.80E-10	3.43E-08	1.02E-09	9.85E-10	5.73E-08	1.75E-07
Arsenic	1.60E-12	2.6E-09	2.52E-10	-	8.91E-11	1.19E-08	1.88E-10	1.78E-10	2.86E-08	6.40E-08
Barium	1.40E-10	1.9E-07	3.26E-08	-	2.78E-09	9.30E-07	2.47E-09	1.02E-09	1.11E-07	5.35E-06
Cadmium	8.55E-12	6.3E-09	1.75E-09	-	3.65E-09	5.76E-08	2.43E-08	2.42E-08	1.90E-08	1.33E-06
Cl-2-x[b]	3.88E-09	2.7E-05	1.81E-06	1.98E-07	1.02E-06	1.63E-05	4.84E-06	4.61E-06	1.52E-06	3.67E-04
Cl-3-x[b]	8.43E-09	2.9E-04	4.24E-05	1.98E-06	9.61E-06	9.43E-04	4.38E-04	4.36E-04	6.04E-05	2.15E-02
Cl-4-x[b]	1.84E-08	2.0E-04	9.13E-06	1.58E-06	5.21E-06	1.49E-04	9.22E-05	9.15E-05	1.87E-05	7.34E-03
Cl-F-x[c]	1.54E-09	3.6E-06	1.35E-06	-	8.73E-07	1.19E-05	1.14E-06	8.61E-07	9.76E-07	1.42E-04
Chromium	2.52E-10	2.4E-07	3.40E-08	-	4.20E-09	1.20E-06	2.46E-08	2.35E-08	1.42E-07	8.67E-06
HC[d]-insoluble	3.95E-10	8.1E-04	1.35E-04	4.94E-06	2.97E-04	2.48E-03	8.80E-04	8.71E-04	1.65E-04	5.57E-02
HC-soluble	9.72E-06	1.8E-03	6.53E-05	2.37E-06	1.13E-04	2.66E-03	1.32E-03	1.32E-03	9.98E-05	7.87E-02
Mercury	2.56E-12	6.9E-08	3.24E-09	-	6.67E-10	3.77E-07	5.90E-09	5.77E-09	3.17E-08	1.55E-06
Lead	7.58E-11	3.1E-07	7.25E-08	-	3.89E-09	1.26E-06	8.10E-09	5.78E-09	2.84E-07	5.87E-06
Selenium	3.84E-12	2.9E-08	9.17E-10	-	1.03E-10	1.59E-07	9.03E-10	8.62E-10	9.42E-09	6.11E-07

TABLE A.12 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	GA	GJPO	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	KCP	LANL
Radionuclide (Ci/yr)										
H-3	-	-	7.24E+03	2.66E+02	1.17E-08	5.55E-07	5.83E-07	1.76E-07	5.59E-09	1.02E+01
Fe-55	-	-	1.95E-04	9.94E-04	1.02E-11	2.55E-07	2.68E-07	8.07E-08	2.56E-09	6.12E-09
Co-60	-	-	1.52E-03	7.63E-03	8.08E-11	1.95E-06	2.05E-06	6.17E-07	1.96E-08	4.87E-08
Ni-59	-	-	5.67E-05	1.04E-04	1.35E-12	2.55E-08	2.68E-08	8.07E-09	2.56E-10	8.12E-10
Ni-63	-	-	6.44E-03	1.38E-02	1.79E-10	3.42E-06	3.60E-06	1.08E-06	3.45E-08	1.08E-07
Sr-90	-	-	1.72E-02	5.36E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	3.70E-08
Y-90	-	-	1.72E-02	5.36E-04	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09	3.70E-08
Nb-94	-	-	2.58E-06	491E-06	-	1.21E-09	1.27E-09	3.84E-10	1.22E-11	-
Sb-125	-	-	4.13E-07	2.10E-06	-	5.39E-10	5.66E-10	1.71E-10	5.43E-12	-
Tc-99	5.08E-12	1.84E-13	8.59E-06	5.80E-07	-	-	-	-	-	1.55E-12
Cs-137	-	-	1.93E-02	5.73E-04	6.12E-11	1.27E-07	1.34E-07	4.03E-08	1.28E-09	3.94E-08
Ba-137m	-	-	1.81E-02	5.45E-04	5.88E-11	1.21E-07	1.27E-07	3.82E-08	1.21E-09	3.54E-08
Pm-147	-	-	1.06E-05	5.56E-05	5.63E-12	1.39E-08	1.46E-08	4.40E-09	1.40E-10	3.39E-09
Sm-151	-	-	2.78E-04	5.10E-06	5.39E-13	1.08E-09	1.13E-09	3.41E-10	1.09E-11	3.25E-10
Eu-154	-	-	3.02E-05	6.47E-06	6.74E-13	1.55E-09	1.63E-09	4.91E-10	1.56E-11	4.06E-10
Th-234	3.39E-10	1.23E-11	1.81E-05	2.56E-05	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11	1.02E-10
U-235	2.64E-13	1.00E-14	-	1.63E-11	-	-	-	-	-	7.90E-14
U-238	3.39E-10	1.23E-11	1.81E-05	2.56E-05	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11	1.02E-10
Pu-238	-	-	8.65E-04	1.86E-05	2.33E-12	3.97E-09	4.18E-09	1.26E-09	4.00E-11	1.40E-09
Pu-239	-	-	1.17E-05	3.46E-08	-	-	-	-	-	-
Pu-240	-	-	6.66E-06	2.75E-07	-	-	-	-	-	-
Pu-241	-	-	1.97E-04	1.85E-05	1.18E-11	3.23E-09	3.40E-09	1.02E-09	3.26E-11	7.08E-09
Am-241	-	-	1.64E-05	3.46E-08	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	2.23E-09	4.24E-11	2.35E-08	8.53E-09	1.81E-10	4.76E-10	1.51E-09	8.31E-10	-	1.63E-08
Methylene chloride	2.30E-06	1.29E-07	7.27E-02	3.08E-03	-	3.11E-05	2.64E-05	4.36E-06	2.98E-07	4.58E-05
Silver	2.26E-09	6.84E-11	5.79E-04	3.35E-05	1.91E-10	3.32E-09	4.26E-09	1.17E-09	6.47E-12	2.08E-08
Arsenic	6.86E-10	2.24E-11	1.32E-05	8.79E-07	-	1.10E-09	1.52E-09	3.91E-10	1.27E-12	3.99E-09
Barium	7.36E-08	8.03E-10	1.28E-02	7.78E-04	-	2.25E-08	7.20E-08	4.46E-08	2.59E-10	8.02E-07
Cadmium	2.86E-09	4.14E-10	1.37E-03	1.55E-04	2.12E-11	1.88E-08	1.59E-08	2.35E-09	2.25E-10	6.54E-08
Cl-2-x	2.13E-06	8.69E-08	3.86E-02	1.38E-03	-	1.80E-05	1.54E-05	3.57E-06	1.75E-07	1.73E-05
Cl-3-x	3.97E-05	6.92E-06	4.57E-01	1.85E-02	8.06E-07	4.51E-04	3.55E-04	5.03E-05	7.23E-07	1.39E-04
Cl-4-x	9.98E-06	1.52E-06	2.92E-01	6.74E-03	4.53E-08	1.69E-04	1.73E-04	2.69E-05	3.89E-07	5.59E-05
Cl-F-x	1.26E-06	2.22E-08	2.81E-03	1.22E-03	-	4.74E-06	2.57E-06	2.39E-06	2.37E-07	1.91E-05
Chromium	9.75E-08	1.67E-09	1.58E-02	7.63E-04	9.10E-10	3.72E-08	9.22E-08	4.52E-08	1.13E-09	6.12E-07
HC-insoluble	1.09E-04	1.41E-05	1.27E+00	4.36E-02	1.11E-05	9.90E-04	7.65E-04	1.11E-04	1.52E-06	7.70E-04
HC-soluble	1.79E-03	6.18E-05	3.22E+00	1.93E-01	3.63E-04	9.47E-04	7.51E-04	9.92E-05	1.62E-09	2.76E-02
Mercury	9.17E-09	1.33E-10	2.76E-04	1.19E-05	1.21E-09	6.27E-09	8.99E-09	2.99E-09	1.88E-10	2.26E-07
Lead	1.32E-07	6.29E-10	1.90E-02	8.72E-04	2.17E-10	3.50E-08	1.82E-07	1.03E-07	7.52E-09	1.91E-06
Selenium	3.79E-09	4.89E-11	1.68E-03	4.52E-05	1.73E-10	1.28E-09	2.05E-09	8.27E-10	1.68E-11	1.85E-08

TABLE A.12 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	LBL	LEHR	LLNL	Mare Is	Norfolk	NTS	ORR	Pantex	Pearl H	PGDP
Radionuclide (Ci/yr)										
H-3	9.30E-06	2.44E-04	3.44E-04	4.83E-07	4.71E-08	3.5E-01	3.48E+01	7.20E+00	3.95E-08	-
Fe-55	-	-	-	2.22E-07	2.16E-08	-	2.18E-04	4.40E-09	1.81E-08	-
Co-60	-	4.69E-10	-	1.70E-06	1.66E-07	2.6E-07	2.65E-03	3.50E-08	1.39E-07	-
Ni-59	-	7.57E-11	-	2.22E-08	2.16E-09	4.2E-08	1.80E-04	5.83E-10	1.81E-09	-
Ni-63	-	7.96E-09	-	2.98E-06	2.91E-07	4.4E-06	1.96E-02	7.73E-08	2.44E-07	-
Sr-90	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	2.41E-03	2.47E-08	8.53E-09	-
Y-90	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	2.41E-03	2.47E-08	8.53E-09	-
Nb-94	-	3.57E-12	-	1.06E-09	1.03E-10	2.0E-09	8.52E-06	-	8.63E-11	-
Sb-125	-	-	-	4.69E-10	4.58E-11	-	4.62E-07	-	3.83E-11	-
Tc-99	-	1.41E-11	-	-	-	7.8E-09	7.77E-05	-	-	3.77E-07
Cs-137	2.05E-09	1.33E-09	7.57E-08	1.11E-07	1.08E-08	7.4E-07	2.72E-03	2.63E-08	9.06E-09	-
Ba-137m	1.95E-09	1.26E-09	7.23E-08	1.05E-07	1.02E-08	6.9E-07	2.75E-03	2.54E-08	8.58E-09	-
Pm-147	-	-	-	1.21E-08	1.18E-09	-	1.19E-05	2.44E-09	9.87E-10	-
Sm-151	-	1.63E-11	-	9.38E-10	9.16E-11	8.9E-09	3.51E-05	2.33E-10	7.67E-11	-
Eu-154	-	4.99E-12	-	1.35E-09	1.32E-10	2.7E-09	1.18E-05	2.91E-10	1.10E-10	-
Th-234	4.75E-10	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	5.58E-04	-	3.40E-10	1.26E-06
U-235	-	-	-	-	-	-	1.49E-07	-	-	9.74E-10
U-238	4.75E-10	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	5.58E-04	-	3.40E-10	1.26E-06
Pu-238	-	5.30E-11	-	3.46E-09	3.38E-10	2.9E-08	1.15E-04	1.01E-09	2.83E-10	-
Pu-239	-	8.56E-13	-	-	-	4.7E-10	1.80E-06	-	-	-
Pu-240	-	1.28E-12	-	-	-	7.1E-10	2.69E-06	-	-	-
Pu-241	4.65E-10	5.62E-11	1.72E-08	2.82E-09	2.75E-10	3.1E-08	1.21E-04	5.09E-09	2.30E-10	-
Am-241	-	8.56E-13	-	-	-	4.7E-10	1.80E-06	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	5.50E-09	3.35E-11	1.53E-07	-	-	7.2E-08	1.36E-07	4.12E-09	4.07E-11	1.54E-08
Methylene chloride	1.15E-04	1.49E-06	1.44E-04	5.54E-06	1.04E-06	3.4E-05	2.49E-02	3.78E-04	5.86E-07	4.38E-04
Silver	6.52E-09	1.19E-10	3.20E-07	6.27E-10	1.69E-10	2.1E-07	1.79E-03	8.84E-09	1.19E-10	2.08E-08
Arsenic	1.49E-09	5.14E-12	8.01E-08	3.09E-10	1.17E-10	8.7E-08	4.44E-05	1.94E-09	6.99E-11	8.92E-09
Barium	2.79E-07	1.66E-09	4.85E-06	1.04E-07	4.77E-09	3.0E-06	4.62E-02	4.51E-07	4.47E-09	5.55E-07
Cadmium	1.54E-08	5.47E-10	1.25E-07	4.95E-09	1.70E-09	1.0E-07	6.52E-03	1.70E-07	1.06E-09	1.46E-06
Cl-2-x	6.06E-05	1.61E-06	2.28E-04	5.98E-06	1.11E-06	3.4E-05	1.92E-02	2.43E-04	6.23E-07	2.45E-04
Cl-3-x	5.67E-04	8.63E-06	7.99E-03	1.19E-04	4.10E-05	6.1E-04	8.82E-01	4.10E-03	2.12E-05	2.46E-02
Cl-4-x	4.37E-04	2.89E-05	6.54E-04	2.65E-05	8.00E-06	1.3E-04	1.77E-01	1.63E-03	4.44E-06	5.43E-03
Cl-F-x	3.24E-06	1.40E-06	1.80E-04	6.98E-06	9.36E-07	3.0E-05	1.10E-02	1.64E-04	6.46E-07	2.44E-05
Chromium	2.91E-07	4.20E-10	5.79E-06	3.19E-08	6.40E-09	3.8E-06	5.58E-02	5.34E-07	3.36E-08	1.83E-06
HC-insoluble	2.68E-03	2.20E-05	1.25E-02	4.05E-04	1.38E-04	2.6E-03	1.85E+00	5.42E-03	6.91E-05	5.13E-02
HC-soluble	1.07E-03	1.01E-05	1.47E-01	1.73E-04	6.57E-05	4.6E-02	6.57E+00	1.98E-03	3.29E-05	2.68E-02
Mercury	1.40E-08	2.78E-10	2.68E-06	2.22E-08	1.91E-09	9.1E-07	1.17E-03	8.21E-08	1.14E-09	1.39E-07
Lead	6.99E-07	8.57E-10	6.71E-06	1.96E-08	3.10E-09	3.7E-06	6.88E-02	2.25E-06	6.73E-09	1.49E-06
Selenium	4.18E-09	2.45E-11	9.04E-07	1.43E-09	5.17E-10	4.0E-07	6.55E-03	1.06E-08	2.93E-10	3.76E-08

TABLE A.12 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)							
	PORTS	Ports Nav	PPPL	Puget So	RMI	SNL-CA	SNL-NM	SRS
Radionuclide (Ci/yr)								
H-3	-	6.89E-09	1.48E-09	8.78E-07	-	2.28E-05	2.73E-07	1.26E+03
Fe-55	-	3.16E-09	-	4.03E-07	-	-	4.29E-10	4.66E-05
Co-60	-	2.42E-08	-	3.08E-06	-	-	2.15E-08	1.15E-03
Ni-59	-	3.16E-10	-	4.03E-08	-	-	2.03E-09	9.09E-05
Ni-63	-	4.25E-08	-	5.42E-06	-	-	2.45E-07	1.10E-02
Sr-90	-	1.49E-09	3.10E-13	1.90E-07	-	4.80E-09	1.46E-08	6.43E-04
Y-90	-	1.49E-09	3.10E-13	1.90E-07	-	4.80E-09	1.46E-08	6.43E-04
Nb-94	-	1.51E-11	-	1.92E-09	-	-	1.03E-10	4.59E-06
Sb-125	-	6.69E-12	-	8.53E-10	-	-	-	5.91E-08
Tc-99	7.16E-09	-	-	-	3.92E-12	-	6.04E-12	2.62E-07
Cs-137	-	1.58E-09	3.25E-13	2.01E-07	-	5.03E-09	1.56E-08	6.91E-04
Ba-137m	-	1.50E-09	3.10E-13	1.91E-07	-	4.80E-09	1.48E-08	6.56E-04
Pm-147	-	1.72E-10	-	2.20E-08	-	-	-	1.52E-06
Sm-151	-	1.34E-11	-	1.71E-09	-	-	1.69E-10	7.46E-06
Eu-154	-	1.92E-11	-	2.45E-09	-	-	7.85E-11	3.58E-06
Th-234	2.38E-08	5.94E-11	7.50E-14	7.57E-09	2.66E-10	1.17E-09	7.25E-11	3.67E-06
U-235	1.85E-11	-	-	-	2.07E-13	-	-	-
U-238	2.38E-08	5.94E-11	7.50E-14	7.57E-09	2.66E-10	1.17E-09	7.25E-11	3.67E-06
Pu-238	-	4.93E-11	-	6.29E-09	-	-	5.32E-10	2.35E-05
Pu-239	-	-	-	-	-	-	-	-
Pu-240	-	-	-	-	-	-	4.23E-10	1.84E-05
Pu-241	-	4.01E-11	7.40E-14	5.12E-09	-	1.14E-09	4.23E-10	1.87E-05
Am-241	-	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)								
Cyanides	1.81E-06	-	-	7.31E-09	3.25E-10	6.92E-11	2.63E-09	1.02E-09
Methylene chloride	2.16E-03	1.32E-07	1.44E-07	1.38E-05	1.76E-05	1.46E-04	7.75E-06	1.21E-02
Silver	1.62E-06	2.83E-11	-	5.84E-09	3.42E-10	4.36E-10	2.32E-09	1.26E-04
Arsenic	5.21E-07	2.35E-11	-	1.85E-09	1.39E-10	2.73E-09	6.65E-10	3.98E-06
Barium	8.78E-05	7.35E-10	-	3.81E-07	2.51E-08	2.48E-08	1.46E-07	3.75E-03
Cadmium	7.29E-07	3.63E-10	-	8.12E-09	4.71E-08	3.51E-07	4.10E-10	4.14E-03
Cl-2-x	2.18E-03	1.32E-07	7.19E-08	1.40E-05	1.13E-05	7.49E-05	8.42E-06	5.99E-03
Cl-3-x	1.45E-02	7.91E-06	7.19E-07	1.18E-04	1.15E-03	1.00E-03	2.82E-05	4.85E-01
Cl-4-x	5.83E-03	1.48E-06	5.75E-07	4.61E-05	2.58E-04	4.27E-04	1.50E-05	1.08E-01
Cl-F-x	1.21E-03	7.50E-08	-	1.39E-05	3.95E-06	6.83E-07	9.07E-06	2.24E-03
Chromium	9.03E-05	4.52E-09	-	9.60E-07	5.29E-08	3.20E-07	1.34E-07	7.57E-03
HC-insoluble	3.40E-02	2.63E-05	1.80E-06	6.87E-05	3.07E-04	3.36E-02	7.69E-05	1.03E+00
HC-soluble	2.09E-01	1.31E-05	8.63E-07	6.52E-06	1.82E-04	1.09E-02	2.64E-06	7.44E-01
Mercury	7.96E-06	3.89E-10	-	1.99E-08	1.42E-09	7.30E-09	6.73E-09	1.02E-04
Lead	2.09E-04	5.67E-10	-	9.29E-07	1.42E-08	7.76E-08	3.36E-07	5.81E-03
Selenium	2.71E-06	1.02E-10	-	5.63E-09	2.83E-10	1.69E-09	2.09E-09	5.90E-04

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.13 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 15, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)									
	Ames	ANL-E	Charleston	Colonie	FEMP	GA	GJPO	Hanford	INEL	LANL
Radionuclide (Ci/yr)										
H-3	-	5.2E-05	9.89E-04	-	-	-	-	1.09E+00	1.85E-01	4.86E-02
Fe-55	-	-	9.53E-06	-	-	-	-	9.99E-09	1.74E-03	8.85E-07
Co-60	-	5.3E-06	7.29E-05	-	-	-	-	2.84E-06	1.33E-02	7.04E-06
Ni-59	-	8.5E-07	9.53E-07	-	-	-	-	4.23E-06	1.74E-04	1.17E-07
Ni-63	-	9.0E-05	1.28E-04	-	-	-	-	4.35E-04	2.34E-02	1.56E-05
Sr-90	-	1.3E-05	4.99E-06	-	-	-	-	5.80E-03	8.58E-04	5.05E-06
Y-90	-	1.3E-05	4.99E-06	-	-	-	-	5.80E-03	8.58E-04	5.05E-06
Nb-94	-	4.0E-08	4.54E-08	-	-	-	-	1.87E-07	8.29E-06	-
Sb-125	-	-	2.02E-08	-	-	-	-	2.11E-11	3.68E-06	-
Tc-99	5.94E-11	1.6E-07	-	2.98E-10	2.74E-07	9.26E-09	2.58E-10	2.87E-06	8.26E-10	-
Cs-137	-	1.5E-05	5.30E-06	-	-	-	-	6.51E-03	9.11E-04	5.37E-06
Ba-137m	-	1.4E-05	4.52E-06	-	-	-	-	2.06E-03	8.25E-04	5.12E-06
Pm-147	-	-	5.20E-07	-	-	-	-	5.44E-10	9.49E-05	4.91E-07
Sm-151	-	1.8E-07	4.04E-08	-	-	-	-	3.16E-05	7.37E-06	4.69E-08
Eu-154	-	5.6E-08	5.80E-08	-	-	-	-	3.30E-06	1.06E-05	5.87E-08
Th-234[a]	3.90E-09	1.9E-06	1.79E-07	1.78E-08	1.81E-05	6.11E-07	1.70E-08	2.37E-06	3.27E-05	-
U-235	3.03E-12	-	-	1.39E-11	1.41E-08	4.75E-10	1.32E-11	-	7.20E-13	-
U-238	3.90E-09	1.9E-06	1.79E-07	1.78E-08	1.81E-05	6.11E-07	1.70E-08	2.37E-06	3.27E-05	-
Pu-238	-	6.0E-07	1.49E-07	-	-	-	-	9.81E-05	2.72E-05	2.03E-07
Pu-239	-	9.6E-09	-	-	-	-	-	1.33E-06	1.47E-12	-
Pu-240	-	1.5E-08	-	-	-	-	-	7.58E-07	8.22E-11	-
Pu-241	-	6.3E-07	1.21E-07	-	-	-	-	2.29E-05	2.22E-05	1.02E-06
Am-241	-	9.6E-09	-	-	-	-	-	1.86E-06	1.47E-12	-
Chemical contaminant (kg/yr)										
Cyanides	7.59E-08	1.0E-05	3.26E-07	3.26E-07	3.53E-04	1.19E-05	3.32E-07	3.39E-09	6.34E-05	1.99E-05
Methylene chloride	1.00E-12	1.0E-10	4.00E-12	4.00E-12	3.61E-09	1.22E-10	4.00E-12	2.54E-09	6.56E-10	2.03E-10
Silver	1.46E-08	2.0E-06	1.16E-08	1.16E-08	7.03E-05	2.39E-06	6.65E-08	2.92E-04	1.46E-05	3.98E-06
Arsenic	3.58E-09	4.9E-07	1.02E-08	1.02E-08	1.69E-05	5.73E-07	1.60E-08	1.87E-06	3.03E-06	9.55E-07
Barium	3.17E-07	4.5E-05	7.25E-09	7.25E-09	1.54E-03	5.26E-05	1.46E-06	1.28E-05	2.73E-04	8.75E-05
Cadmium	1.36E-08	1.8E-06	6.45E-08	6.45E-08	6.29E-05	2.13E-06	5.92E-08	5.33E-06	1.15E-05	3.54E-06
Cl-2-x[b]	1.00E-12	1.0E-10	1.80E-11	1.80E-11	3.72E-09	1.22E-10	4.00E-12	3.29E-09	7.24E-10	2.03E-10
Cl-3-x[b]	2.00E-12	2.2E-10	2.30E-11	2.30E-11	7.69E-09	2.56E-10	7.00E-12	1.31E-07	3.56E-09	4.26E-10
Cl-4-x[b]	5.00E-12	6.2E-10	2.20E-11	2.20E-11	2.16E-08	7.31E-10	2.00E-11	7.38E-09	4.01E-09	1.22E-09
Cl-F-x[c]	-	5.2E-11	2.00E-12	2.00E-12	1.80E-09	6.10E-11	2.00E-12	2.67E-09	3.40E-10	1.01E-10
Chromium	5.65E-07	7.9E-05	2.47E-07	2.47E-07	2.74E-03	9.32E-05	2.59E-06	9.47E-05	4.93E-04	1.55E-04
HC[d]-insoluble	-	6.0E-12	4.00E-12	4.00E-12	2.45E-10	7.00E-12	-	1.21E-07	1.97E-08	1.20E-11
HC-soluble	7.91E-04	1.1E-01	3.62E-06	3.62E-06	3.85E+00	1.31E-01	3.65E-03	6.77E-01	8.05E-01	2.18E-01
Mercury	3.07E-10	4.0E-08	1.67E-09	1.67E-09	1.42E-06	4.78E-08	1.33E-09	9.02E-05	1.01E-05	7.96E-08
Lead	1.64E-07	2.2E-05	4.71E-07	4.71E-07	7.75E-04	2.63E-05	7.31E-07	4.71E-05	1.40E-04	4.38E-05
Selenium	8.69E-09	1.2E-06	3.63E-09	3.63E-09	4.21E-05	1.43E-06	3.99E-08	1.38E-05	8.87E-06	2.39E-06

TABLE A.13 (Cont.)

Contaminant	Annual Releases to Water (unit as indicated)							
	LEHR	NTS	ORR	Pantex	PGDP	PORTS	RMI	SRS
Radionuclide (Ci/yr)								
H-3	1.17E-06	1.7E-03	4.76E-03	3.44E-02	-	-	-	4.77E-03
Fe-55	-	-	1.20E-05	6.27E-07	-	-	-	3.27E-06
Co-60	1.18E-07	1.7E-04	4.48E-04	4.99E-06	-	-	-	3.12E-05
Ni-59	1.91E-08	2.8E-05	5.87E-05	8.31E-08	-	-	-	1.01E-06
Ni-63	2.01E-06	2.9E-03	6.21E-03	1.10E-05	-	-	-	1.26E-04
Sr-90	3.34E-07	4.4E-04	4.33E-03	3.95E-06	-	-	-	4.08E-05
Y-90	3.34E-07	4.4E-04	4.33E-03	3.95E-06	-	-	-	4.08E-05
Nb-94	9.00E-10	1.3E-06	2.77E-06	-	-	-	-	5.00E-08
Sb-125	-	-	2.54E-08	-	-	-	-	6.60E-09
Tc-99	4.00E-09	5.2E-06	1.68E-04	-	3.06E-05	1.66E-06	2.05E-09	3.92E-09
Cs-137	3.78E-07	5.0E-04	4.89E-03	4.20E-06	-	-	-	4.34E-05
Ba-137m	3.18E-07	4.6E-04	9.64E-04	3.63E-06	-	-	-	6.54E-06
Pm-147	4.10E-09	-	6.55E-07	3.48E-07	-	-	-	1.70E-07
Sm-151	1.26E-09	5.9E-06	1.24E-05	3.33E-08	-	-	-	7.10E-08
Eu-154	4.35E-08	1.8E-06	3.87E-06	4.16E-08	-	-	-	4.58E-08
Th-234	4.35E-08	6.3E-05	1.50E-04	-	9.28E-05	5.36E-06	1.24E-07	8.34E-08
U-235	-	-	1.43E-08	-	7.20E-08	4.16E-09	9.62E-11	-
U-238	1.34E-08	6.3E-05	1.50E-04	-	9.28E-05	5.36E-06	1.24E-07	8.34E-08
Pu-238	2.16E-10	1.9E-05	4.05E-05	1.44E-07	-	-	-	2.30E-07
Pu-239	3.24E-10	3.1E-07	6.51E-07	-	-	-	-	-
Pu-240	1.42E-08	4.7E-07	9.76E-07	-	-	-	-	1.45E-07
Pu-241	2.16E-10	2.1E-05	4.28E-05	7.26E-07	-	-	-	1.84E-07
Am-241	-	3.1E-07	-	-	-	-	-	-
Chemical contaminant (kg/yr)								
Cyanides	2.12E-07	1.0E-05	5.47E-04	1.32E-05	5.56E-06	4.53E-04	2.28E-06	1.95E-06
Methylene chloride	3.00E-12	1.0E-10	1.39E-08	1.50E-10	6.20E-11	4.72E-09	2.60E-11	3.30E-11
Silver	7.55E-09	2.0E-06	2.14E-04	4.69E-07	3.38E-07	7.64E-05	1.12E-07	2.50E-07
Arsenic	6.61E-09	4.9E-07	3.69E-05	4.11E-07	1.88E-07	2.03E-05	7.40E-08	7.97E-08
Barium	4.72E-09	4.5E-05	1.85E-03	2.93E-07	3.86E-06	1.61E-03	8.81E-07	1.74E-07
Cadmium	4.20E-08	1.8E-06	1.08E-04	2.61E-06	1.08E-06	8.23E-05	4.46E-07	3.96E-07
Cl-2-x	1.20E-11	1.0E-10	3.56E-08	7.51E-10	2.76E-10	8.66E-09	1.21E-10	1.45E-10
Cl-3-x	1.50E-11	2.2E-10	9.47E-07	9.47E-10	3.57E-10	1.41E-08	1.53E-10	1.49E-09
Cl-4-x	1.40E-11	6.2E-10	8.68E-08	8.86E-10	3.68E-10	2.82E-08	1.51E-10	2.06E-10
Cl-F-x	1.00E-12	5.2E-11	2.17E-08	7.50E-11	3.20E-11	2.36E-09	1.20E-11	3.80E-11
Chromium	1.61E-07	7.9E-05	3.55E-03	9.97E-06	1.02E-05	2.92E-03	3.06E-06	1.94E-06
HC-insoluble	3.00E-12	6.0E-12	9.86E-07	1.66E-10	6.00E-11	1.31E-09	2.60E-11	1.44E-09
HC-soluble	2.36E-06	1.1E-01	9.98E+00	1.46E-04	9.42E-03	4.02E+00	2.11E-03	8.08E-03
Mercury	1.09E-09	4.1E-08	7.01E-04	6.75E-08	2.75E-08	1.91E-06	1.14E-08	1.02E-06
Lead	3.07E-07	2.2E-05	1.20E-03	1.91E-05	8.68E-06	9.31E-04	3.43E-06	2.97E-06
Selenium	2.36E-09	1.2E-06	1.56E-04	1.47E-07	1.55E-07	4.49E-05	4.60E-08	1.76E-07

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.14 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 17, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Charleston	Colonie	ETEC	FEMP
Radionuclide (Ci/yr)										
H-3	-	1.1E-02	7.86E-08	-	2.12E-09	2.51E-09	2.07E-01	-	1.77E-08	-
Fe-55	-	-	3.61E-08	-	-	-	6.57E-08	-	-	-
Co-60	-	5.61E-09	2.76E-07	-	3.58E-11	1.21E-08	5.03E-07	-	8.55E-08	-
Ni-59	-	9.06E-10	3.61E-09	-	5.47E-11	1.96E-09	6.57E-09	-	1.38E-08	-
Ni-63	-	9.53E-08	4.85E-07	-	5.62E-09	2.06E-07	8.83E-07	-	1.45E-06	-
Sr-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Y-90	-	1.43E-08	1.70E-08	-	2.53E-08	3.08E-08	3.07E-08	-	2.17E-07	-
Nb-94	-	4.27E-11	1.72E-10	-	2.43E-12	9.22E-11	3.13E-10	-	6.51E-10	-
Sb-125	-	-	7.64E-11	-	-	-	1.39E-10	-	-	-
Tc-99	4.00E-14	1.71E-10	-	-	1.27E-11	3.68E-10	-	1.70E-12	2.60E-09	2.89E-10
Cs-137	-	1.61E-08	1.80E-08	-	2.84E-08	3.48E-08	3.26E-08	-	2.46E-07	-
Ba-137m	-	1.51E-08	1.71E-08	-	2.65E-08	3.26E-08	3.11E-08	-	2.30E-07	-
Pm-147	-	-	1.97E-09	-	-	-	3.58E-09	-	-	-
Sm-151	-	1.94E-10	1.53E-10	-	4.09E-10	4.20E-10	2.78E-10	-	2.96E-09	-
Eu-154	-	5.97E-11	2.20E-10	-	4.27E-11	1.29E-10	4.00E-10	-	9.11E-10	-
Th-234[a]	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	3.15E-08	-
U-235	-	-	-	-	-	-	-	8.90E-14	3.15E-08	1.92E-08
U-238	2.70E-12	2.06E-09	6.78E-10	1.70E-13	1.57E-11	4.46E-09	1.23E-09	1.14E-10	-	1.49E-11
Pu-238	-	6.34E-10	5.63E-10	-	1.27E-09	1.37E-09	1.03E-09	-	9.67E-09	1.92E-08
Pu-239	-	1.02E-11	-	-	1.72E-11	2.21E-11	-	-	1.56E-10	-
Pu-240	-	1.54E-11	-	-	9.81E-12	3.32E-11	-	-	2.34E-10	-
Pu-241	-	6.72E-10	4.58E-10	-	2.82E-10	1.45E-09	8.34E-10	-	1.02E-08	-
Am-241	-	1.02E-11	-	-	2.41E-11	2.21E-11	-	-	1.56E-10	-
Cm-244	-	-	-	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)										
Cyanides	8.09E-12	4.0E-09	5.50E-10	-	1.70E-11	1.70E-08	5.79E-10	5.63E-10	4.29E-10	1.01E-07
Methylene chloride	3.07E-09	5.3E-05	1.74E-06	3.96E-07	1.22E-06	2.03E-05	7.46E-06	7.26E-06	1.47E-06	5.06E-04
Silver	8.87E-12	8.0E-09	5.86E-10	-	2.80E-10	3.43E-08	1.02E-09	9.85E-10	5.73E-08	1.75E-07
Arsenic	1.60E-12	2.6E-09	2.52E-10	-	8.91E-11	1.19E-08	1.88E-10	1.78E-10	2.86E-08	6.40E-08
Barium	1.40E-10	1.9E-07	3.26E-08	-	2.78E-09	9.30E-07	2.47E-09	1.02E-09	1.11E-07	5.35E-06
Cadmium	8.55E-12	6.3E-09	1.75E-09	-	3.65E-09	5.76E-08	2.43E-08	2.42E-08	1.90E-08	1.33E-06
Cl-2-x[b]	3.88E-09	2.7E-05	1.81E-06	1.98E-07	1.02E-06	1.63E-05	4.84E-06	4.61E-06	1.52E-06	3.67E-04
Cl-3-x[b]	8.43E-09	2.9E-04	4.24E-05	1.98E-06	9.61E-06	9.43E-04	4.38E-04	4.36E-04	6.04E-05	2.15E-02
Cl-4-x[b]	1.84E-08	2.0E-04	9.13E-06	1.58E-06	5.21E-06	1.49E-04	9.22E-05	9.15E-05	1.87E-05	7.34E-03
Cl-F-x[c]	1.54E-09	3.6E-06	1.35E-06	-	8.73E-07	1.19E-05	1.14E-06	8.61E-07	9.76E-07	1.42E-04
Chromium	2.52E-10	2.4E-07	3.40E-08	-	4.20E-09	1.20E-06	2.46E-08	2.35E-08	1.42E-07	8.67E-06
HC[d]-insoluble	3.95E-10	8.1E-04	1.35E-04	4.94E-06	2.97E-04	2.48E-03	8.80E-04	8.71E-04	1.65E-04	5.57E-02
HC-soluble	9.72E-06	1.8E-03	6.53E-05	2.37E-06	1.13E-04	2.66E-03	1.32E-03	1.32E-03	9.98E-05	7.87E-02
Mercury	2.56E-12	6.9E-08	3.24E-09	-	6.67E-10	3.77E-07	5.90E-09	5.77E-09	3.17E-08	1.55E-06
Lead	7.58E-11	3.1E-07	7.25E-08	-	3.89E-09	1.26E-06	8.10E-09	5.78E-09	2.84E-07	5.87E-06
Selenium	3.84E-12	2.9E-08	9.17E-10	-	1.03E-10	1.59E-07	9.03E-10	8.62E-10	9.42E-09	6.11E-07

TABLE A.14 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)								
	GA	GJPO	Hanford	INEL	ITRI	KAPL-K	KAPL-S	KAPL-W	KCP
Radionuclide (Ci/yr)									
H-3	-	-	8.75E+03	3.77E+01	1.17E-08	5.55E-07	5.83E-07	1.76E-07	5.59E-09
Fe-55	-	-	1.45E-03	3.34E-06	1.02E-11	2.55E-07	2.68E-07	8.07E-08	2.56E-09
Co-60	-	-	1.29E-02	2.55E-05	8.08E-11	1.95E-06	2.05E-06	6.17E-07	1.96E-08
Ni-59	-	-	4.32E-04	3.34E-07	1.35E-12	2.55E-08	2.68E-08	8.07E-09	2.56E-10
Ni-63	-	-	5.09E-02	4.49E-05	1.79E-10	3.42E-06	3.60E-06	1.08E-06	3.45E-08
Sr-90	-	-	2.08E-02	1.57E-06	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09
Y-90	-	-	2.08E-02	1.57E-06	5.76E-11	1.20E-07	1.26E-07	3.80E-08	1.21E-09
Nb-94	-	-	2.06E-05	1.59E-08	-	1.21E-09	1.27E-09	3.84E-10	1.22E-11
Sb-125	-	-	8.71E-05	7.06E-09	-	5.39E-10	5.66E-10	1.71E-10	5.43E-12
Tc-99	5.08E-12	1.84E-13	3.03E-06	-	-	-	-	-	-
Cs-137	-	-	2.33E-02	1.67E-06	6.12E-11	1.27E-07	1.34E-07	4.03E-08	1.28E-09
Ba-137m	-	-	2.21E-02	1.58E-06	5.88E-11	1.21E-07	1.27E-07	3.82E-08	1.21E-09
Pm-147	-	-	7.96E-05	1.82E-07	5.63E-12	1.39E-08	1.46E-08	4.40E-09	1.40E-10
Sm-151	-	-	3.26E-04	1.41E-08	5.39E-13	1.08E-09	1.13E-09	3.41E-10	1.09E-11
Eu-154	-	-	5.20E-05	2.03E-08	6.74E-13	1.55E-09	1.63E-09	4.91E-10	1.56E-11
Th-234	-	-	6.05E-04	6.27E-08	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11
U-235	3.39E-10	1.23E-11	1.49E-07	-	-	-	-	-	-
U-238	2.64E-13	1.00E-14	6.05E-04	6.27E-08	-	4.78E-09	5.03E-09	1.51E-09	4.82E-11
Pu-238	3.39E-10	1.23E-11	1.02E-03	5.21E-08	2.33E-12	3.97E-09	4.18E-09	1.26E-09	4.00E-11
Pu-239	-	-	1.35E-05	-	-	-	-	-	-
Pu-240	-	-	2.80E-05	-	-	-	-	-	-
Pu-241	-	-	3.55E-04	4.24E-08	1.18E-11	3.23E-09	3.40E-09	1.02E-09	3.26E-11
Am-241	-	-	1.82E-05	-	-	-	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	2.23E-09	4.24E-11	9.91E-08	4.54E-08	-	4.76E-10	1.51E-09	8.31E-10	-
Methylene chloride	2.30E-06	1.29E-07	1.13E-01	2.10E-04	1.81E-10	3.11E-05	2.64E-05	4.36E-06	2.98E-07
Silver	2.26E-09	6.84E-11	2.53E-03	5.07E-08	1.91E-10	3.32E-09	4.26E-09	1.17E-09	6.47E-12
Arsenic	6.86E-10	2.24E-11	6.25E-05	2.31E-08	-	1.10E-09	1.52E-09	3.91E-10	1.27E-12
Barium	7.36E-08	8.03E-10	6.35E-02	2.40E-06	-	2.25E-08	7.20E-08	4.46E-08	2.59E-10
Cadmium	2.86E-09	4.14E-10	1.22E-02	3.70E-07	2.12E-11	1.88E-08	1.59E-08	2.35E-09	2.25E-10
Cl-2-x	2.13E-06	8.69E-08	6.51E-02	1.49E-04	-	1.80E-05	1.54E-05	3.57E-06	1.75E-07
Cl-3-x	3.97E-05	6.92E-06	1.84E+00	5.03E-03	8.06E-07	4.51E-04	3.55E-04	5.03E-05	7.23E-07
Cl-4-x	9.98E-06	1.52E-06	5.83E-01	1.10E-03	4.53E-08	1.69E-04	1.73E-04	2.69E-05	3.89E-07
Cl-F-x	1.26E-06	2.22E-08	1.73E-02	8.53E-05	-	4.74E-06	2.57E-06	2.39E-06	2.37E-07
Chromium	9.75E-08	1.67E-09	8.00E-02	3.32E-06	9.10E-10	3.72E-08	9.22E-08	4.52E-08	1.13E-09
HC-insoluble	1.09E-04	1.41E-05	4.19E+00	1.98E-02	1.11E-05	9.90E-04	7.65E-04	1.11E-04	1.52E-06
HC-soluble	1.79E-03	6.18E-05	1.07E+01	1.73E-02	3.63E-04	9.47E-04	7.51E-04	9.92E-05	1.62E-09
Mercury	9.17E-09	1.33E-10	1.56E-03	3.49E-07	1.21E-09	6.27E-09	8.99E-09	2.99E-09	1.88E-10
Lead	1.32E-07	6.29E-10	9.46E-02	7.43E-06	2.17E-10	3.50E-08	1.82E-07	1.03E-07	7.52E-09
Selenium	3.79E-09	4.89E-11	8.86E-03	9.30E-08	1.73E-10	1.28E-09	2.05E-09	8.27E-10	1.68E-11

TABLE A.14 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)									
	LANL	LBL	LEHR	LLNL	Mare Is	Norfolk	NTS	ORR	Pantex	Pearl H
Radionuclide (Ci/yr)										
H-3	1.02E+01	9.30E-06	2.44E-04	3.44E-04	4.83E-07	4.71E-08	3.5E-01	5.99E-01	7.20E+00	3.95E-08
Fe-55	2.36E-09	-	-	-	2.22E-07	2.16E-08	-	-	4.40E-09	1.81E-08
Co-60	1.88E-08	-	4.69E-10	-	1.70E-06	1.66E-07	2.6E-07	3.36E-06	3.50E-08	1.39E-07
Ni-59	3.13E-10	-	7.57E-11	-	2.22E-08	2.16E-09	4.2E-08	5.42E-07	5.83E-10	1.81E-09
Ni-63	4.15E-08	-	7.96E-09	-	2.98E-06	2.91E-07	4.4E-06	5.70E-05	7.73E-08	2.44E-07
Sr-90	1.34E-08	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	8.52E-06	2.47E-08	8.53E-09
Y-90	1.34E-08	1.95E-09	1.18E-09	7.23E-08	1.04E-07	1.02E-08	6.6E-07	8.52E-06	2.47E-08	8.53E-09
Nb-94	-	-	3.57E-12	-	1.06E-09	1.03E-10	2.0E-09	2.55E-08	-	8.63E-11
Sb-125	-	-	-	-	4.69E-10	4.58E-11	-	-	-	3.83E-11
Tc-99	-	-	1.41E-11	-	-	-	7.8E-09	1.02E-07	-	-
Cs-137	1.42E-08	2.05E-09	1.33E-09	7.57E-08	1.11E-07	1.08E-08	7.4E-07	9.63E-06	2.63E-08	9.06E-09
Ba-137m	1.37E-08	1.95E-09	1.26E-09	7.23E-08	1.05E-07	1.02E-08	6.9E-07	9.02E-06	2.54E-08	8.58E-09
Pm-147	1.31E-09	-	-	-	1.21E-08	1.18E-09	-	-	2.44E-09	9.87E-10
Sm-151	1.25E-10	-	1.63E-11	-	9.38E-10	9.16E-11	8.9E-09	1.16E-07	2.33E-10	7.67E-11
Eu-154	1.56E-10	-	4.99E-12	-	1.35E-09	1.32E-10	2.7E-09	3.57E-08	2.91E-10	1.10E-10
Th-234	-	4.75E-10	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	1.23E-06	-	3.40E-10
U-235	-	-	-	-	-	-	-	-	-	-
U-238	-	4.75E-10	1.72E-10	1.76E-08	4.16E-09	4.06E-10	9.5E-08	1.23E-06	-	3.40E-10
Pu-238	5.41E-10	-	5.30E-11	-	3.46E-09	3.38E-10	2.9E-08	3.79E-07	1.01E-09	2.83E-10
Pu-239	-	-	8.56E-13	-	-	-	4.7E-10	6.13E-09	-	-
Pu-240	-	-	1.28E-12	-	-	-	7.1E-10	9.19E-09	-	-
Pu-241	2.73E-09	4.65E-10	5.62E-11	1.72E-08	2.82E-09	2.75E-10	3.1E-08	4.02E-07	5.09E-09	2.30E-10
Am-241	-	-	8.56E-13	-	-	-	4.7E-10	6.13E-09	-	-
Chemical contaminant (kg/yr)										
Cyanides	1.63E-08	5.50E-09	3.35E-11	1.53E-07	-	-	7.2E-08	2.87E-06	4.12E-09	4.07E-11
Methylene chloride	4.58E-05	1.15E-04	1.49E-06	1.44E-04	5.54E-06	1.04E-06	3.4E-05	1.23E-02	3.78E-04	5.86E-07
Silver	1.76E-08	6.52E-09	1.19E-10	3.20E-07	6.27E-10	1.69E-10	2.1E-07	5.80E-06	8.84E-09	1.19E-10
Arsenic	1.43E-09	1.49E-09	5.14E-12	8.01E-08	3.09E-10	1.17E-10	8.7E-08	1.92E-06	1.94E-09	6.99E-11
Barium	7.92E-07	2.79E-07	1.66E-09	4.85E-06	1.04E-07	4.77E-09	3.0E-06	1.37E-04	4.51E-07	4.47E-09
Cadmium	4.94E-08	1.54E-08	5.47E-10	1.25E-07	4.95E-09	1.70E-09	1.0E-07	3.65E-05	1.70E-07	1.06E-09
Cl-2-x	1.73E-05	6.06E-05	1.61E-06	2.28E-04	5.98E-06	1.11E-06	3.4E-05	8.37E-03	2.43E-04	6.23E-07
Cl-3-x	1.39E-04	5.67E-04	8.63E-06	7.99E-03	1.19E-04	4.10E-05	6.1E-04	6.82E-01	4.10E-03	2.12E-05
Cl-4-x	5.59E-05	4.37E-04	2.89E-05	6.54E-04	2.65E-05	8.00E-06	1.3E-04	1.41E-01	1.63E-03	4.44E-06
Cl-F-x	1.91E-05	3.24E-06	1.40E-06	1.80E-04	6.89E-06	9.36E-07	3.0E-05	3.26E-03	1.64E-04	6.46E-07
Chromium	5.36E-07	2.91E-07	4.20E-10	5.79E-06	3.19E-08	6.40E-09	3.8E-06	1.84E-04	5.34E-07	3.36E-08
HC-insoluble	7.70E-04	2.68E-03	2.20E-05	1.25E-02	4.05E-04	1.38E-04	2.6E-03	1.21E+00	5.42E-03	6.91E-05
HC-soluble	2.76E-02	1.07E-03	1.01E-05	1.47E-01	1.73E-04	6.57E-05	4.6E-02	1.50E+00	1.98E-03	3.29E-05
Mercury	2.26E-07	1.40E-08	2.78E-10	2.68E-06	2.22E-08	1.91E-09	9.1E-07	5.58E-05	8.21E-08	1.14E-09
Lead	1.79E-06	6.99E-07	8.57E-10	6.71E-06	1.96E-08	3.10E-09	3.7E-06	1.95E-04	2.25E-06	6.73E-09
Selenium	1.73E-08	4.18E-09	2.45E-11	9.04E-07	1.43E-09	5.17E-10	4.0E-07	2.20E-05	1.06E-08	2.93E-10

TABLE A.14 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)								
	PGDP	PORTS	Ports Nav	PPPL	Puget So	RMI	SNL-CA	SNL-NM	SRS
Radionuclide (Ci/yr)									
H-3	-	-	6.89E-09	1.48E-09	8.78E-07	-	2.28E-05	2.73E-07	8.93E-01
Fe-55	-	-	3.16E-09	-	4.03E-07	-	-	4.29E-10	9.88E-08
Co-60	-	-	2.42E-08	-	3.08E-06	-	-	2.15E-08	4.96E-06
Ni-59	-	-	3.16E-10	-	4.03E-08	-	-	2.03E-09	4.68E-07
Ni-63	-	-	4.25E-08	-	5.42E-06	-	-	2.45E-07	5.65E-05
Sr-90	-	-	1.49E-09	3.10E-13	1.90E-07	-	4.80E-09	1.46E-08	3.35E-06
Y-90	-	-	1.49E-09	3.10E-13	1.90E-07	-	4.80E-09	1.46E-08	3.35E-06
Nb-94	-	-	1.51E-11	-	1.92E-09	-	-	1.03E-10	2.37E-08
Sb-125	-	-	6.69E-12	-	8.53E-10	-	-	-	-
Tc-99	3.77E-07	7.16E-09	-	-	-	3.92E-12	-	6.04E-12	1.39E-09
Cs-137	-	-	1.58E-09	3.25E-13	2.01E-07	-	5.03E-09	1.56E-08	3.60E-06
Ba-137m	-	-	1.50E-09	3.10E-13	1.91E-07	-	4.80E-09	1.48E-08	3.41E-06
Pm-147	-	-	1.72E-10	-	2.20E-08	-	-	-	-
Sm-151	-	-	1.34E-11	-	1.71E-09	-	-	1.69E-10	3.90E-08
Eu-154	-	-	1.92E-11	-	2.45E-09	-	-	7.85E-11	1.81E-08
Th-234	1.26E-06	2.38E-08	5.94E-11	7.50E-14	7.57E-09	2.66E-10	1.17E-09	7.25E-11	1.67E-08
U-235	9.74E-10	1.85E-11	-	-	-	2.07E-13	-	-	-
U-238	1.26E-06	2.38E-08	5.94E-11	7.50E-14	7.57E-09	2.66E-10	1.17E-09	7.25E-11	1.67E-08
Pu-238	-	-	4.93E-11	-	6.29E-09	-	-	5.32E-10	1.22E-07
Pu-239	-	-	-	-	-	-	-	-	-
Pu-240	-	-	-	-	-	-	-	4.23E-10	9.74E-08
Pu-241	-	-	4.01E-11	7.40E-14	5.12E-09	-	1.14E-09	4.23E-10	9.74E-08
Am-241	-	-	-	-	-	-	-	-	-
Chemical contaminant (kg/yr)									
Cyanides	1.54E-08	1.81E-06	-	-	7.31E-09	3.25E-10	6.92E-11	2.63E-09	2.64E-07
Methylene chloride	4.38E-04	2.16E-03	1.32E-07	1.44E-07	1.38E-05	1.76E-05	1.46E-04	7.75E-06	8.37E-03
Silver	2.08E-08	1.62E-06	2.83E-11	-	5.84E-09	3.42E-10	4.36E-10	2.32E-09	5.08E-07
Arsenic	8.92E-09	5.21E-07	2.35E-11	-	1.85E-09	1.39E-10	2.73E-09	6.65E-10	2.53E-07
Barium	5.55E-07	8.78E-05	7.35E-10	-	3.81E-07	2.51E-08	2.48E-08	1.46E-07	1.66E-05
Cadmium	1.46E-06	7.29E-07	3.63E-10	-	8.12E-09	4.71E-08	3.51E-07	4.10E-10	2.80E-05
Cl-2-x	2.45E-04	2.18E-03	1.32E-07	7.19E-08	1.40E-05	1.13E-05	7.49E-05	8.42E-06	4.49E-03
Cl-3-x	2.46E-02	1.45E-02	7.91E-06	7.19E-07	1.18E-04	1.15E-03	1.00E-03	2.82E-05	4.61E-01
Cl-4-x	5.43E-03	5.83E-03	1.48E-06	5.75E-07	4.61E-05	2.58E-04	4.27E-04	1.50E-05	1.02E-01
Cl-F-x	2.44E-05	1.21E-03	7.50E-08	-	1.39E-05	3.95E-06	6.83E-07	9.07E-06	5.44E-04
Chromium	1.83E-06	9.03E-05	4.52E-09	-	9.60E-07	5.29E-08	3.20E-07	1.34E-07	4.21E-05
HC-insoluble	5.13E-02	3.40E-02	2.63E-05	1.80E-06	6.87E-05	3.07E-04	3.36E-02	7.69E-05	9.75E-01
HC-soluble	2.68E-02	2.09E-01	1.31E-05	8.63E-07	6.52E-06	1.82E-04	1.09E-02	2.64E-06	3.37E-01
Mercury	1.39E-07	7.96E-06	3.89E-10	-	1.99E-08	1.42E-09	7.30E-09	6.73E-09	6.17E-06
Lead	1.49E-06	2.09E-04	5.67E-10	-	9.29E-07	1.42E-08	7.76E-08	3.36E-07	3.56E-05
Selenium	3.76E-08	2.71E-06	1.02E-10	-	5.63E-09	2.83E-10	1.69E-09	2.09E-09	2.40E-06

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.15 Annual Air Emissions by Site: CH Alpha LLMW — Case 17, Non-PCBs

Contaminant	Annual Air Emissions (unit as indicated)									
	Bettis	Hanford	INEL	LANL	LLNL	Mound	RFETS	SRS	UofMO	WVDP
Radionuclide (Ci/yr)										
H-3	2.60E-09	5.10E+03	1.96E-01	4.66E+00	2.97E-04	4.80E-06	-	8.38E-06	-	7.84E-03
Fe-55	-	3.34E-06	-	9.60E-09	-	-	-	1.08E-08	-	-
Co-60	4.39E-11	6.58E-04	2.94E-06	7.63E-08	-	-	-	5.69E-07	-	1.44E-10
Ni-59	6.72E-11	8.26E-04	4.49E-06	1.27E-09	-	-	-	9.03E-08	-	2.20E-10
Ni-63	6.91E-09	7.62E-02	4.13E-04	1.69E-07	-	-	-	9.80E-06	-	2.27E-08
Sr-90	3.12E-08	1.57E-03	7.86E-06	5.44E-08	6.24E-08	1.01E-09	-	5.16E-07	-	1.02E-07
Y-90	3.12E-08	1.57E-03	7.86E-06	5.44E-08	6.24E-08	1.01E-09	-	5.16E-07	-	1.02E-07
Nb-94	3.00E-12	3.62E-05	1.97E-07	-	-	-	-	4.23E-09	-	9.85E-12
Tc-99	1.56E-11	2.39E-08	-	-	-	-	-	-	-	5.10E-11
Cs-137	3.51E-08	1.74E-03	8.71E-06	5.78E-08	6.54E-08	1.06E-09	-	5.60E-07	-	1.15E-07
Ba-137m	3.28E-08	1.66E-03	8.24E-06	5.55E-08	6.24E-08	1.01E-09	-	5.31E-07	-	1.08E-07
Pm-147	-	5.65E-07	-	5.32E-09	-	-	-	-	-	-
Sm-151	5.02E-10	2.50E-05	1.26E-07	5.06E-10	-	-	-	6.56E-09	-	1.65E-09
Eu-154	5.23E-11	3.18E-06	1.40E-08	6.36E-10	-	-	-	2.33E-09	-	1.72E-10
Th-234[a]	1.93E-11	1.36E-04	7.44E-07	-	1.52E-08	2.45E-10	5.20E-09	2.96E-09	3.70E-14	6.33E-11
U-238	1.93E-11	1.36E-04	7.44E-07	-	1.52E-08	2.45E-10	5.20E-09	2.96E-09	3.70E-14	6.33E-11
Pu-238	1.63E-09	1.05E-04	4.35E-07	1.16E-08	1.49E-08	2.40E-10	5.56E-07	2.98E-08	3.92E-12	5.35E-09
Pu-239	2.70E-11	1.87E-06	-	9.30E-10	-	-	5.70E-08	8.46E-10	4.01E-13	8.87E-11
Pu-240	1.20E-11	8.93E-06	1.40E-08	3.12E-09	-	-	1.99E-07	3.17E-09	1.40E-12	3.94E-11
Pu-241	7.02E-10	2.96E-04	3.74E-07	2.06E-07	2.97E-07	4.81E-09	5.43E-06	1.21E-07	3.82E-11	2.30E-09
Am-241	3.00E-11	1.76E-06	9.36E-09	-	-	-	1.06E-09	-	7.00E-15	9.85E-11
Cm-244	-	3.89E-08	-	-	-	-	1.44E-09	-	1.00E-14	-
Chemical contaminant (kg/yr)										
Cyanides	-	3.37E-08	5.74E-07	5.67E-08	8.39E-08	-	2.48E-06	2.40E-07	9.88E-11	1.67E-09
Methylene chloride	2.10E-06	8.95E-02	6.11E-03	7.88E-04	3.45E-04	3.00E-05	1.74E-03	3.67E-04	1.16E-07	5.81E-06
Silver	1.50E-10	2.31E-04	5.35E-07	1.50E-07	1.34E-07	5.12E-12	2.13E-06	2.10E-07	7.49E-11	4.15E-09
Arsenic	-	1.34E-05	2.28E-07	2.57E-08	2.83E-08	2.72E-10	5.34E-07	7.67E-08	2.50E-11	9.05E-10
Barium	6.01E-09	6.79E-03	3.21E-05	6.11E-07	2.24E-06	1.18E-09	4.97E-05	1.24E-05	5.00E-09	1.86E-08
Cadmium	3.00E-11	9.40E-04	6.31E-06	7.55E-07	8.36E-07	1.04E-07	4.47E-06	2.54E-07	1.25E-11	1.21E-08
Cl-2-x[b]	2.45E-06	3.35E-02	2.72E-03	4.06E-04	2.66E-04	1.58E-05	1.45E-03	3.75E-04	1.16E-07	7.05E-06
Cl-3-x[b]	8.73E-06	2.37E-01	2.22E-02	7.08E-03	1.52E-02	1.72E-03	1.46E-02	6.47E-03	3.25E-07	4.07E-04
Cl-4-x[b]	4.19E-06	1.29E-01	8.83E-03	1.16E-03	2.95E-03	3.84E-04	1.21E-02	1.46E-03	2.03E-07	6.38E-05
Cl-F-x[c]	3.49E-06	4.67E-02	2.95E-03	4.16E-04	1.80E-04	6.91E-07	1.97E-03	1.87E-04	5.81E-08	3.93E-06
Chromium	2.25E-10	1.69E-02	9.11E-05	4.51E-06	1.24E-05	8.90E-08	3.65E-04	1.27E-05	5.00E-09	3.93E-08
HC[d]-insoluble	3.49E-05	2.23E-01	4.35E-02	3.93E-03	2.73E-02	3.62E-03	2.51E-02	1.91E-02	5.81E-07	6.92E-04
HC-soluble	1.75E-08	1.13E+00	1.89E-02	9.47E-02	9.35E-02	1.24E-03	3.05E+00	2.07E-02	2.90E-08	3.54E-03
Mercury	3.00E-11	2.01E-04	7.63E-06	1.34E-06	8.78E-07	5.84E-10	1.29E-06	9.18E-07	2.50E-10	2.68E-08
Lead	1.50E-09	1.51E-02	2.55E-04	2.62E-05	7.61E-06	1.98E-08	4.17E-05	3.00E-05	1.25E-08	1.64E-08
Selenium	4.51E-11	3.86E-04	1.26E-06	1.66E-07	1.90E-07	8.30E-14	1.32E-06	2.56E-07	7.49E-11	4.99E-09

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.16 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 17, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)									
	Ames	ANL-E	Charleston	Colonie	FEMP	GA	GJPO	Hanford	INEL	LANL
Radionuclide (Ci/yr)										
H-3	-	5.2E-05	9.89E-04	-	-	-	-	1.10E+00	1.80E-01	4.86E-02
Fe-55	-	-	9.53E-06	-	-	-	-	1.85E-05	1.74E-03	8.85E-07
Co-60	-	5.3E-06	7.29E-05	-	-	-	-	2.10E-04	1.33E-02	7.04E-06
Ni-59	-	8.5E-07	9.53E-07	-	-	-	-	1.67E-05	1.74E-04	1.17E-07
Ni-63	-	9.0E-05	1.28E-04	-	-	-	-	1.80E-03	2.34E-02	1.56E-05
Sr-90	-	1.3E-05	4.99E-06	-	-	-	-	9.43E-03	8.25E-04	5.05E-06
Y-90	-	1.3E-05	4.99E-06	-	-	-	-	9.43E-03	8.25E-04	5.05E-06
Nb-94	-	4.0E-08	4.54E-08	-	-	-	-	7.75E-07	8.27E-06	-
Tc-99	5.94E-11	-	-	2.98E-10	2.74E-07	9.26E-09	2.58E-10	1.62E-04	-	-
Sb-125	-	1.6E-07	2.02E-08	-	-	-	-	3.89E-08	3.68E-06	-
Cs-137	-	1.5E-05	5.30E-06	-	-	-	-	1.06E-02	8.76E-04	5.37E-06
Ba-137m	-	1.4E-05	4.52E-06	-	-	-	-	2.24E-03	8.23E-04	5.12E-06
Pm-147	-	-	5.20E-07	-	-	-	-	1.05E-06	9.47E-05	4.91E-07
Sm-151	-	1.8E-07	4.04E-08	-	-	-	-	3.39E-05	7.35E-06	4.69E-08
Eu-154	-	5.6E-08	5.80E-08	-	-	-	-	4.12E-06	1.06E-05	5.87E-08
Th-234[a]	-	1.9E-06	1.79E-07	-	-	-	-	4.53E-05	3.26E-05	-
U-235	3.90E-09	-	-	1.78E-08	1.81E-05	6.11E-07	1.70E-08	1.43E-08	-	-
U-238	3.03E-12	1.9E-06	1.79E-07	1.39E-11	1.41E-08	4.75E-10	1.32E-11	4.53E-05	3.26E-05	-
Pu-238	3.90E-09	6.0E-07	1.49E-07	1.78E-08	1.81E-05	6.11E-07	1.70E-08	1.06E-04	2.71E-05	2.03E-07
Pu-239	-	9.6E-09	-	-	-	-	-	1.45E-06	-	-
Pu-240	-	1.5E-08	-	-	-	-	-	9.44E-07	-	-
Pu-241	-	6.3E-07	1.21E-07	-	-	-	-	3.11E-05	2.21E-05	1.02E-06
Am-241	-	9.6E-09	-	-	-	-	-	1.98E-06	-	-
Chemical contaminant (kg/yr)										
Cyanides	7.59E-08	1.0E-05	3.26E-07	3.26E-07	3.53E-04	1.19E-05	3.32E-07	3.21E-08	6.34E-05	1.99E-05
Methylene chloride	1.00E-12	1.0E-10	4.00E-12	4.00E-12	3.61E-09	1.22E-10	4.00E-12	1.07E-08	6.47E-10	2.03E-10
Silver	1.46E-08	2.0E-06	1.16E-08	1.16E-08	7.03E-05	2.39E-06	6.65E-08	4.23E-04	1.25E-05	3.98E-06
Arsenic	3.58E-09	4.9E-07	1.02E-08	1.02E-08	1.69E-05	5.73E-07	1.60E-08	1.51E-05	3.02E-06	9.55E-07
Barium	3.17E-07	4.5E-05	7.25E-09	7.25E-09	1.54E-03	5.26E-05	1.46E-06	1.03E-04	2.73E-04	8.75E-05
Cadmium	1.36E-08	1.8E-06	6.45E-08	6.45E-08	6.29E-05	2.13E-06	5.92E-08	1.33E-05	1.13E-05	3.54E-06
Cl-2-x[b]	1.00E-12	1.0E-10	1.80E-11	1.80E-11	3.72E-09	1.22E-10	4.00E-12	2.65E-08	7.05E-10	2.03E-10
Cl-3-x[b]	2.00E-12	2.2E-10	2.30E-11	2.30E-11	7.69E-09	2.56E-10	7.00E-12	1.06E-06	1.42E-09	4.26E-10
Cl-4-x[b]	5.00E-12	6.2E-10	2.20E-11	2.20E-11	2.16E-08	7.31E-10	2.00E-11	6.00E-08	3.89E-09	1.22E-09
Cl-F-x[c]	-	5.2E-11	2.00E-12	2.00E-12	1.80E-09	6.10E-11	2.00E-12	2.15E-08	3.24E-10	1.01E-10
Chromium	5.65E-07	7.9E-05	2.47E-07	2.47E-07	2.74E-03	9.32E-05	2.59E-06	4.31E-04	4.85E-04	1.55E-04
HC[d]-insoluble	-	6.0E-12	4.00E-12	4.00E-12	2.45E-10	7.00E-12	-	1.13E-06	5.30E-11	1.20E-11
HC-soluble	7.91E-04	1.1E-01	3.62E-06	3.62E-06	3.85E+00	1.31E-01	3.65E-03	6.41E+00	6.82E-01	2.18E-01
Mercury	3.07E-10	4.0E-08	1.67E-09	1.67E-09	1.42E-06	4.78E-08	1.33E-09	8.00E-04	2.55E-07	7.96E-08
Lead	1.64E-07	2.2E-05	4.71E-07	4.71E-07	7.75E-04	2.63E-05	7.31E-07	1.60E-04	1.38E-04	4.38E-05
Selenium	8.69E-09	1.2E-06	3.63E-09	3.63E-09	4.21E-05	1.43E-06	3.99E-08	1.22E-04	7.47E-06	2.39E-06

TABLE A.16 (Cont.)

Contaminant	Annual Releases to Water (unit as indicated)							
	LEHR	NTS	ORR	Pantex	PGDP	PORTS	RMI	SRS
Radionuclide (Ci/yr)								
H-3	1.17E-06	1.7E-03	2.87E-03	3.44E-02	-	-	-	4.27E-03
Fe-55	-	-	-	6.27E-07	-	-	-	1.41E-07
Co-60	1.18E-07	1.7E-04	2.91E-04	4.99E-06	-	-	-	7.06E-06
Ni-59	1.91E-08	2.8E-05	4.69E-05	8.31E-08	-	-	-	6.66E-07
Ni-63	2.01E-06	2.9E-03	4.94E-03	1.10E-05	-	-	-	8.06E-05
Sr-90	3.34E-07	4.4E-04	7.66E-04	3.95E-06	-	-	-	5.31E-06
Y-90	3.34E-07	4.4E-04	7.66E-04	3.95E-06	-	-	-	5.31E-06
Nb-94	9.00E-10	1.3E-06	2.21E-06	-	-	-	-	3.37E-08
Tc-99	4.00E-09	-	9.16E-06	-	3.06E-05	1.66E-06	2.05E-09	2.20E-09
Sb-125	-	5.2E-06	-	-	-	-	-	-
Cs-137	3.78E-07	5.0E-04	8.66E-04	4.20E-06	-	-	-	5.71E-06
Ba-137m	3.18E-07	4.6E-04	7.82E-04	3.63E-06	-	-	-	4.86E-06
Pm-147	-	-	-	3.48E-07	-	-	-	-
Sm-151	4.10E-09	5.9E-06	1.01E-05	3.33E-08	-	-	-	5.55E-08
Eu-154	1.26E-09	1.8E-06	3.10E-06	4.16E-08	-	-	-	2.58E-08
Th-234	4.35E-08	6.3E-05	1.07E-04	-	9.28E-05	5.36E-06	1.24E-07	2.38E-08
U-235	-	-	-	-	7.20E-08	4.16E-09	9.62E-11	-
U-238	4.35E-08	6.3E-05	1.07E-04	-	9.28E-05	5.36E-06	1.24E-07	2.38E-08
Pu-238	1.34E-08	1.9E-05	3.29E-05	1.44E-07	-	-	-	1.75E-07
Pu-239	2.16E-10	3.1E-07	5.31E-07	-	-	-	-	-
Pu-240	3.24E-10	4.7E-07	7.96E-07	-	-	-	-	1.39E-07
Pu-241	1.42E-08	2.1E-05	3.48E-05	7.26E-07	-	-	-	1.39E-07
Am-241	2.16E-10	3.1E-07	5.31E-07	-	-	-	-	-
Chemical contaminant (kg/yr)								
Cyanides	2.12E-07	1.0E-05	5.47E-04	1.32E-05	5.56E-06	4.53E-04	2.28E-06	1.95E-06
Methylene chloride	3.00E-12	1.0E-10	5.76E-09	1.50E-10	6.20E-11	4.72E-09	2.60E-11	2.20E-11
Silver	7.55E-09	2.0E-06	8.51E-05	4.69E-07	3.38E-07	7.64E-05	1.12E-07	6.92E-08
Arsenic	6.61E-09	4.9E-07	2.38E-05	4.11E-07	1.88E-07	2.03E-05	7.40E-08	6.05E-08
Barium	4.72E-09	4.5E-05	1.76E-03	2.93E-07	3.86E-06	1.61E-03	8.81E-07	4.32E-08
Cadmium	4.20E-08	1.8E-06	1.00E-04	2.61E-06	1.08E-06	8.23E-05	4.46E-07	3.85E-07
Cl-2-x	1.20E-11	1.0E-10	1.25E-08	7.51E-10	2.76E-10	8.66E-09	1.21E-10	1.11E-10
Cl-3-x	1.50E-11	2.2E-10	1.92E-08	9.47E-10	3.57E-10	1.41E-08	1.53E-10	1.40E-10
Cl-4-x	1.40E-11	6.2E-10	3.44E-08	8.86E-10	3.68E-10	2.82E-08	1.51E-10	1.30E-10
Cl-F-x	1.00E-12	5.2E-11	2.88E-09	7.50E-11	3.20E-11	2.36E-09	1.20E-11	1.10E-11
Chromium	1.61E-07	7.9E-05	3.23E-03	9.97E-06	1.02E-05	2.92E-03	3.06E-06	1.47E-06
HC-insoluble	3.00E-12	6.0E-12	2.10E-09	1.66E-10	6.00E-11	1.31E-09	2.60E-11	2.40E-11
HC-soluble	2.36E-06	1.1E-01	4.38E+00	1.46E-04	9.42E-03	4.02E+00	2.11E-03	2.16E-05
Mercury	1.09E-09	4.1E-08	2.35E-06	6.75E-08	2.75E-08	1.91E-06	1.14E-08	9.95E-09
Lead	3.07E-07	2.2E-05	1.09E-03	1.91E-05	8.68E-06	9.31E-04	3.43E-06	2.81E-06
Selenium	2.36E-09	1.2E-06	4.96E-05	1.47E-07	1.55E-07	4.49E-05	4.60E-08	2.16E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.17 Annual Contaminant Releases to Water by Site: CH Alpha LLMW — Case 17, Non-PCBs

Contaminant	Annual Releases to Water (unit as indicated)				
	Hanford	INEL	LANL	RFETS	WVDP
Radionuclide (Ci/yr)					
H-3	6.59E-01	9.36E-04	2.23E-02	-	3.75E-05
Fe-55	9.75E-07	-	4.06E-07	-	-
Co-60	1.03E-05	4.88E-06	3.23E-06	-	1.33E-08
Ni-59	6.08E-07	7.46E-06	5.38E-08	-	2.03E-08
Ni-63	6.88E-05	6.85E-04	7.14E-06	-	2.09E-06
Sr-90	3.44E-04	1.45E-05	2.31E-06	-	9.87E-06
Y-90	3.44E-04	1.45E-05	2.31E-06	-	9.87E-06
Nb-94	2.27E-08	3.26E-07	-	-	9.09E-10
Tc-99	7.14E-08	-	-	-	4.93E-09
Cs-137	3.75E-04	1.61E-05	2.46E-06	-	1.11E-05
Ba-137m	1.86E-05	1.37E-05	2.35E-06	-	9.93E-06
Pm-147	5.10E-07	-	2.25E-07	-	-
Sm-151	2.03E-07	2.10E-07	2.14E-08	-	1.52E-07
Eu-154	8.55E-08	2.33E-08	2.69E-08	-	1.58E-08
Th-234[a]	6.73E-07	1.24E-06	-	9.44E-06	5.84E-09
U-238	6.73E-07	1.24E-06	-	9.44E-06	5.84E-09
Pu-238	2.44E-06	7.23E-07	4.89E-07	1.01E-03	4.93E-07
Pu-239	1.15E-07	-	3.93E-08	1.04E-04	8.18E-09
Pu-240	3.70E-07	2.33E-08	1.32E-07	3.62E-04	3.64E-09
Pu-241	3.47E-05	6.22E-07	8.70E-06	9.87E-03	2.13E-07
Am-241	7.46E-09	1.55E-08	-	1.93E-06	9.09E-09
Cm-244	3.76E-10	-	-	2.62E-06	-
Chemical contaminant (kg/yr)					
Cyanides	4.75E-09	2.24E-06	8.57E-06	2.26E-02	5.49E-07
Methylene chloride	2.07E-09	2.60E-11	8.70E-11	2.31E-07	6.00E-12
Silver	4.32E-05	7.96E-08	1.71E-06	4.50E-03	7.88E-08
Arsenic	3.20E-06	6.96E-08	4.11E-07	1.08E-03	2.32E-08
Barium	2.18E-05	4.97E-08	3.77E-05	9.90E-02	1.59E-06
Cadmium	1.59E-06	4.43E-07	1.53E-06	4.02E-03	1.01E-07
Cl-2-x[b]	5.63E-09	1.27E-10	8.70E-11	2.34E-07	1.50E-11
Cl-3-x[b]	2.21E-07	1.61E-10	1.83E-10	4.88E-07	2.00E-11
Cl-4-x[b]	1.25E-08	1.50E-10	5.25E-10	1.38E-06	3.40E-11
Cl-F-x[c]	4.56E-09	1.20E-11	4.40E-11	1.15E-07	3.00E-12
Chromium	5.92E-05	1.69E-06	6.69E-05	1.76E-01	2.95E-06
HC[d]-insoluble	1.74E-07	2.80E-11	6.00E-12	1.48E-08	2.00E-12
HC-soluble	9.49E-01	2.48E-05	9.41E-02	2.47E+02	3.96E-03
Mercury	1.38E-04	1.14E-08	3.43E-08	9.04E-05	2.41E-09
Lead	2.33E-05	3.23E-06	1.89E-05	4.96E-02	1.07E-06
Selenium	2.13E-05	2.49E-08	1.03E-06	2.70E-03	4.54E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.18 Annual Air Emissions: RH LLMW — Case 26, Non-PCBs

	Annual Air Emissions by Site (unit as indicated)						
	RH Non-Alpha LLMW						RH Alpha LLMW
Contaminant	ANL-W	Bettis	Hanford	INEL	ORR	SRS	INEL
Radionuclide (Ci/yr)							
H-3	2.70E-08	4.01E-12	1.22E-02	1.52E+03	2.19E+02	2.55E+01	3.68E-01
Fe-55	1.24E-08	-	-	2.80E-03	-	5.40E-07	-
Co-60	9.49E-08	6.80E-14	8.15E-09	2.14E-02	9.48E-04	2.71E-05	5.02E-07
Ni-59	1.24E-09	1.03E-13	1.25E-08	2.80E-04	1.53E-04	2.56E-06	7.67E-07
Ni-63	1.67E-07	1.06E-11	1.28E-06	3.76E-02	1.61E-02	3.09E-04	7.05E-05
Sr-90	5.84E-09	4.77E-11	5.76E-06	1.32E-03	2.07E-03	1.83E-05	1.34E-06
Y-90	5.84E-09	4.77E-11	5.76E-06	1.32E-03	2.07E-03	1.83E-05	1.34E-06
Nb-94	5.91E-11	-	5.52E-10	1.33E-05	7.21E-06	1.29E-07	3.36E-08
Sb-125	2.62E-11	-	-	5.92E-06	-	-	-
Tc-99	-	2.40E-14	2.89E-09	-	2.48E-05	7.61E-09	-
Cs-137	6.20E-09	5.36E-11	6.46E-06	1.40E-03	2.34E-03	1.97E-05	1.49E-06
Ba-137m	5.87E-09	5.01E-11	6.04E-06	1.32E-03	2.55E-03	1.87E-05	1.41E-06
Pm-147	6.76E-10	-	-	1.52E-04	-	-	-
Sm-151	5.25E-11	7.72E-13	9.30E-08	1.18E-05	3.28E-05	2.13E-07	2.16E-08
Eu-154	7.55E-11	8.10E-14	9.72E-09	1.70E-05	1.01E-05	9.90E-08	2.40E-09
Th-234[a]	2.33E-10	3.00E-14	3.57E-09	5.25E-05	3.49E-04	9.13E-08	1.27E-07
U-238	2.33E-10	3.00E-14	3.57E-09	5.25E-05	3.49E-04	9.13E-08	1.27E-07
Pu-238	1.94E-10	2.40E-12	2.89E-07	4.37E-05	1.07E-04	6.70E-07	7.44E-08
Pu-239	-	3.20E-14	3.92E-09	-	1.73E-06	-	-
Pu-240	-	1.90E-14	2.23E-09	-	2.60E-06	5.33E-07	2.40E-09
Pu-241	1.57E-10	5.32E-13	6.41E-08	3.55E-05	1.14E-04	5.33E-07	6.40E-08
Am-241	-	4.60E-14	5.49E-09	-	1.73E-06	-	1.60E-09
Chemical contaminant (kg/yr)							
Cyanides	2.72E-11	1.64E-10	-	1.86E-08	1.73E-07	3.75E-11	1.38E-11
Methylene chloride	3.21E-08	3.50E-14	5.99E-08	1.70E-03	9.95E-05	3.36E-05	2.01E-06
Silver	6.79E-11	2.90E-14	4.26E-09	3.27E-05	2.98E-06	2.51E-07	2.53E-08
Arsenic	2.46E-11	9.18E-13	7.87E-11	2.33E-06	5.17E-07	8.50E-09	1.74E-09
Barium	1.11E-08	4.24E-13	1.11E-07	2.18E-03	6.55E-05	1.44E-05	1.67E-06
Cadmium	3.45E-12	1.64E-10	5.11E-08	5.44E-06	2.65E-06	7.27E-07	6.34E-09
Cl-2-x[b]	3.21E-08	9.86E-09	5.99E-08	1.70E-03	9.95E-05	1.43E-05	1.54E-06
Cl-3-x[b]	2.55E-07	1.81E-09	3.60E-06	4.76E-03	2.09E-04	1.13E-04	5.10E-06
Cl-4-x[b]	5.61E-08	7.39E-11	6.59E-07	2.97E-03	5.97E-04	4.53E-05	3.41E-06
Cl-F-x[c]	1.60E-08	1.59E-12	2.70E-08	8.50E-04	4.98E-05	1.55E-05	1.15E-06
Chromium	6.46E-09	3.29E-08	1.92E-07	2.18E-03	1.16E-04	1.41E-05	1.79E-06
HC[d]-insoluble	1.60E-07	1.64E-08	1.20E-05	8.50E-03	6.04E-06	2.11E-04	6.79E-06
HC-soluble	8.01E-09	4.77E-13	6.52E-05	6.10E-03	2.27E-01	1.13E-03	5.14E-06
Mercury	6.89E-11	7.06E-13	1.38E-09	2.44E-05	4.32E-08	1.77E-07	2.03E-08
Lead	3.89E-09	1.27E-13	8.51E-08	5.44E-03	3.28E-05	1.76E-05	4.10E-06
Selenium	2.07E-11	5.99E-08	1.53E-08	3.26E-05	1.79E-06	7.68E-07	2.47E-08

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.19 Annual Contaminant Releases to Water at ORR: RH Non-Alpha LLMW — Case 26, Non-PCBs

Contaminant	Annual Releases (unit as indicated)
Radionuclide (Ci/yr)	
H-3	1.04E+00
Co-60	1.05E–01
Ni-59	1.70E–02
Ni-63	1.78E+00
Sr-90	2.69E–01
Y-90	2.69E–01
Nb-94	7.99E–04
Tc-99	3.21E–03
Cs-137	3.04E–01
Ba-137m	2.82E–01
Sm-151	3.64E–03
Eu-154	1.12E–03
Th-234[a]	3.86E–02
U-238	3.86E–02
Pu-238	1.19E–02
Pu-239	1.92E–04
Pu-240	2.88E–04
Pu-241	1.26E–02
Am-241	1.92E–04
Chemical contaminant (kg/yr)	
Cyanides	1.65E–03
Methylene chloride	1.68E–08
Silver	3.30E–04
Arsenic	7.92E–05
Barium	7.26E–03
Cadmium	2.94E–04
Cl-2-x[b]	1.68E–08
Cl-3-x[b]	3.54E–08
Cl-4-x[b]	1.01E–07
Cl-F-x[c]	8.42E–09
Chromium	1.29E–02
HC[d]-insoluble	1.01E–09
HC-soluble	1.81E+01
Mercury	6.60E–06
Lead	3.63E–03
Selenium	1.98E–04

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.20 Annual Air Emissions by Site: CH Non-Alpha LLMW — Case 2a, PCB-Contaminated

Contaminant	Annual Air Emissions (unit as indicated)					
	Bettis	Charleston	FEMP	Hanford	INEL	Mound
Radionuclide (Ci/yr)						
H-3	1.56E−02	4.54E−02	-	4.30E+00	1.53E−01	6.18E+00
Fe-55	-	1.24E−07	-	1.72E−06	5.40E−07	-
Co-60	9.53E−10	9.45E−07	-	1.53E−05	4.13E−06	-
Ni-59	1.46E−09	1.24E−08	-	3.47E−06	5.40E−08	-
Ni-63	1.50E−07	1.66E−06	-	3.62E−04	7.26E−06	-
Sr-90	6.73E−07	3.16E−08	-	1.52E−03	2.28E−07	6.28E−09
Y-90	6.73E−07	3.16E−08	-	1.52E−03	2.28E−07	6.28E−09
Nb-94	6.46E−11	5.88E−10	-	1.54E−07	2.57E−09	-
Tc-99	3.38E−10	-	9.35E−11	7.65E−07	-	-
Sb-125	-	2.62E−10	-	3.65E−09	1.14E−09	-
Cs-137	7.56E−07	3.36E−08	-	1.71E−03	2.42E−07	6.58E−09
Ba-137m	7.07E−07	5.85E−08	-	1.60E−03	2.56E−07	6.28E−09
Pm-147	-	6.73E−09	-	9.39E−08	2.94E−08	-
Sm-151	1.09E−08	5.23E−10	-	2.46E−05	2.29E−09	-
Eu-154	1.14E−09	7.52E−10	-	2.58E−06	3.29E−09	-
Th-234[a]	4.18E−10	2.32E−09	6.21E−09	9.79E−07	1.01E−08	1.53E−09
U-235	-	-	4.83E−12	-	-	-
U-238	4.18E−10	2.32E−09	6.21E−09	9.79E−07	1.01E−08	1.53E−09
Pu-238	3.38E−08	1.93E−09	-	7.66E−05	8.43E−09	-
Pu-239	4.58E−10	-	-	1.04E−06	-	-
Pu-240	2.61E−10	-	-	5.91E−07	-	-
Pu-241	7.50E−09	1.57E−09	-	1.70E−05	6.86E−09	1.50E−09
Am-241	6.43E−10	-	-	1.45E−06	-	-
Chemical contaminant (kg/yr)						
Cyanides	1.61E−11	2.69E−13	4.60E−13	1.92E−10	3.50E−13	-
Methylene chloride	1.94E−06	1.35E−07	2.80E−06	1.41E−02	4.65E−07	2.40E−06
PCBs	4.54E−10	1.44E−11	2.59E−10	1.96E−07	4.19E−11	7.49E−11
Silver	2.83E−08	1.99E−09	3.52E−08	1.22E−05	2.21E−09	-
Arsenic	4.19E−10	6.46E−12	5.76E−11	2.12E−07	2.32E−10	-
Barium	1.89E−06	2.45E−09	5.39E−08	3.63E−04	1.18E−08	-
Cadmium	1.44E−07	5.79E−08	1.88E−07	1.13E−04	3.66E−07	7.83E−07
Cl-2-x[b]	1.87E−06	9.66E−08	2.80E−06	7.17E−03	2.68E−07	1.27E−06
Cl-3-x[b]	6.27E−06	8.42E−06	1.16E−05	7.78E−02	1.10E−05	1.81E−04
Cl-4-x[b]	3.39E−06	1.67E−06	8.74E−05	5.73E−02	2.22E−06	4.04E−05
Cl-F-x[c]	8.90E−07	2.78E−08	1.40E−06	1.38E−04	2.78E−08	7.49E−08
Chromium	2.00E−06	5.44E−08	1.17E−07	4.48E−04	3.12E−07	6.83E−07
HC[d]-insoluble	8.44E−05	1.65E−05	2.32E−05	2.01E−01	1.67E−04	4.94E−07
HC-soluble	3.17E−05	2.33E−05	1.16E−05	3.04E−01	7.39E−05	9.63E−06
Mercury	5.32E−09	3.27E−10	1.42E−08	3.47E−06	1.73E−09	1.51E−10
Lead	4.74E−06	1.28E−08	2.47E−07	2.68E−04	7.17E−08	1.49E−07
Selenium	2.83E−08	1.75E−09	3.94E−09	3.48E−05	1.93E−09	-
Dioxin	7.82E−09	2.31E−09	6.31E−08	8.14E−06	7.01E−09	2.05E−08
Furans	7.02E−08	2.08E−08	5.66E−07	7.31E−05	6.29E−05	1.84E−07

TABLE A.20 (Cont.)

Contaminant	Annual Air Emissions (unit as indicated)				
	ORR	PORTS	Puget So	SRS	WVDP
Radionuclide (Ci/yr)					
H-3	3.97E+00	6.31E-08	5.16E+00	4.70E-10	1.62E-09
Fe-55	-	-	2.64E-05	1.27E-08	-
Co-60	1.29E-04	-	2.02E-04	9.73E-08	1.85E-10
Ni-59	2.08E-05	-	2.64E-06	1.27E-09	2.83E-10
Ni-63	2.19E-03	-	3.55E-04	1.71E-07	2.90E-08
Sr-90	2.83E-04	7.92E-10	1.24E-05	5.99E-09	1.31E-07
Y-90	2.83E-04	7.92E-10	1.24E-05	5.99E-09	1.31E-07
Nb-94	9.79E-07	-	1.26E-07	6.06E-11	1.25E-11
Tc-99	3.39E-06	4.59E-07	-	-	6.56E-11
Sb-125	-	-	5.59E-08	2.69E-11	-
Cs-137	3.20E-04	8.30E-10	1.32E-05	6.36E-09	1.47E-07
Ba-137m	3.46E-04	7.92E-10	1.25E-05	6.03E-09	1.37E-07
Pm-147	-	-	1.44E-06	6.93E-10	-
Sm-151	4.46E-06	-	1.12E-07	5.39E-11	2.11E-09
Eu-154	1.37E-06	-	1.61E-07	7.74E-11	2.21E-10
Th-234	4.73E-05	1.61E-06	4.96E-07	2.39E-10	8.11E-11
U-235	-	1.25E-09	-	-	-
U-238	4.73E-05	1.61E-06	4.96E-07	2.39E-10	8.11E-11
Pu-238	1.46E-05	-	4.12E-07	1.99E-10	6.56E-09
Pu-239	2.35E-07	-	-	-	8.88E-11
Pu-240	3.52E-07	-	-	-	5.07E-11
Pu-241	1.54E-05	1.89E-10	3.35E-07	1.62E-10	1.45E-09
Am-241	2.35E-07	-	-	-	1.25E-10
Chemical contaminant (kg/yr)					
Cyanides	5.25E-09	1.26E-09	1.08E-10	4.00E-14	3.48E-12
Methylene chloride	1.05E-02	4.93E-04	1.52E-05	1.20E-14	3.12E-10
PCBs	7.27E-07	2.58E-06	3.80E-09	1.03E-11	7.81E-10
Silver	3.55E-05	5.22E-05	4.22E-07	2.14E-10	6.14E-09
Arsenic	2.02E-06	1.12E-06	3.23E-09	4.33E-11	2.13E-09
Barium	1.05E-04	7.46E-05	1.87E-05	2.55E-10	4.10E-07
Cadmium	5.20E-03	2.49E-04	2.83E-06	6.04E-09	1.23E-08
Cl-2-x	5.98E-03	3.53E-04	1.52E-05	9.00E-15	3.12E-10
Cl-3-x	6.06E-01	3.05E-02	2.32E-04	1.72E-11	8.73E-10
Cl-4-x	1.32E-01	6.23E-03	5.73E-05	1.04E-12	5.46E-10
Cl-F-x	6.57E-04	1.03E-04	7.45E-06	-	1.56E-10
Chromium	4.53E-03	3.05E-04	2.31E-05	5.68E-09	4.19E-07
HC-insoluble	1.25E+00	6.02E-02	7.23E-04	2.31E-10	1.57E-09
HC-soluble	7.12E-01	8.66E-02	3.68E-03	1.70E-09	2.38E-09
Mercury	2.78E-05	7.04E-06	4.96E-08	1.25E-09	2.05E-08
Lead	1.02E-03	2.27E-04	3.62E-05	1.34E-09	1.03E-06
Selenium	3.08E-05	9.42E-06	1.03E-06	1.87E-10	6.14E-09
Dioxin	1.19E-04	2.50E-05	1.20E-07	-	-
Furans	1.07E-03	2.24E-04	1.07E-06	-	-

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.21 Annual Contaminant Releases to Water by Site: CH Non-Alpha LLMW — Case 2a, PCB-Contaminated

Contaminant	Annual Releases to Water (unit as indicated)				
	Charleston	Hanford	INEL	ORR	PORTS
Radionuclide (Ci/yr)					
H-3	4.92E–06	1.19E–05	4.92E–06	1.47E–04	-
Fe-55	4.75E–08	-	4.75E–08	-	-
Co-60	3.63E–07	4.22E–09	3.63E–07	1.49E–05	-
Ni-59	4.75E–09	6.46E–09	4.75E–09	2.40E–06	-
Ni-63	6.38E–07	6.63E–07	6.38E–07	2.53E–04	-
Sr-90	4.82E–07	8.71E–06	4.82E–07	8.00E–04	-
Y-90	4.82E–07	8.71E–06	4.82E–07	8.00E–04	-
Nb-94	2.26E–10	2.86E–10	2.26E–10	1.13E–07	-
Tc-99	-	4.37E–09	-	9.57E–06	4.79E–07
Sb-125	1.01E–10	-	1.01E–10	-	-
Cs-137	5.11E–07	9.78E–06	5.11E–07	9.05E–04	-
Ba-137m	2.25E–08	3.13E–06	2.25E–08	4.00E–05	-
Pm-147	2.59E–09	-	2.59E–09	-	-
Sm-151	2.01E–10	4.82E–08	2.01E–10	5.16E–07	-
Eu-154	2.89E–10	5.04E–09	2.89E–10	1.58E–07	-
Th-234[a]	8.92E–10	1.85E–09	8.92E–10	5.47E–06	7.39E–08
U-235	-	-	-	-	5.73E–11
U-238	8.92E–10	1.85E–09	8.92E–10	5.47E–06	7.39E–08
Pu-238	7.41E–10	1.50E–07	7.41E–10	1.68E–06	-
Pu-239	-	2.03E–09	-	2.72E–08	-
Pu-240	-	1.16E–09	-	4.07E–08	-
Pu-241	6.03E–10	3.32E–08	6.03E–10	1.78E–06	-
Am-241	-	2.85E–09	-	2.72E–08	-
Chemical contaminant (kg/yr)					
Cyanides	-	-	-	5.06E–09	1.22E–09
Methylene chloride	-	2.00E–12	-	1.96E–09	4.14E–10
PCBs	-	1.00E–11	-	1.47E–09	3.22E–10
Silver	1.57E–09	4.17E–07	1.57E–09	2.67E–05	5.65E–06
Arsenic	1.86E–10	-	1.86E–10	3.15E–06	6.71E–07
Barium	1.27E–09	-	1.27E–09	2.15E–05	4.57E–06
Cadmium	9.20E–11	6.68E–09	9.20E–11	1.40E–06	3.31E–07
Cl-2-x[b]	-	-	-	5.54E–09	1.18E–09
Cl-3-x[b]	1.30E–11	-	1.30E–11	2.18E–07	4.68E–08
Cl-4-x[b]	1.00E–12	-	1.00E–12	1.23E–08	2.65E–09
Cl-F-x[c]	-	-	-	4.49E–09	9.56E–10
Chromium	3.93E–09	8.35E–08	3.93E–09	5.94E–05	1.42E–05
HC[d]-insoluble	1.20E–11	-	1.20E–11	1.83E–07	4.34E–08
HC-soluble	6.73E–05	-	6.73E–05	1.01E+00	2.43E–01
Mercury	8.97E–09	-	8.97E–09	1.42E–04	3.23E–05
Lead	1.39E–09	5.01E–08	1.39E–09	2.20E–05	5.02E–06
Selenium	1.38E–09	-	1.38E–09	2.18E–05	4.96E–06

[a] Th-234 is in equilibrium with Pa-234m.

[b] Chlorinated solvents (number indicates chlorine content).

[c] Chlorofluorocarbon solvents (Freons).

[d] Hydrocarbons.

TABLE A.22 Annual Air Emissions at the Hanford Site: CH LLMW — Case 17, PCB-Contaminated[a]

Contaminant	Annual Releases (unit as indicated)	
	Non-Alpha	Alpha
Radionuclide (Ci/yr)		
H-3	1.98E+01	5.60E-01
Fe-55	2.89E-05	-
Co-60	3.53E-04	3.60E-10
Ni-59	2.71E-05	5.52E-10
Ni-63	2.93E-03	1.79E-08
Sr-90	1.82E-03	2.61E-07
Y-90	1.82E-03	2.61E-07
Nb-94	1.27E-06	2.47E-11
Tc-99	4.64E-06	1.28E-10
Sb-125	6.12E-08	-
Cs-137	2.05E-03	2.93E-07
Ba-137m	1.96E-03	2.74E-07
Pm-147	1.58E-06	-
Sm-151	2.93E-05	4.12E-09
Eu-154	4.13E-06	4.30E-10
Th-234[b]	5.08E-05	1.32E-09
U-235	1.26E-09	-
U-238	5.08E-05	1.32E-09
Pu-238	9.17E-05	1.79E-08
Pu-239	1.27E-06	5.74E-10
Pu-240	9.46E-07	1.33E-09
Pu-241	3.29E-05	6.14E-08
Am-241	1.69E-06	2.53E-10
Cm-244	-	8.89E-12
Chemical contaminant (kg/yr)		
Cyanides	1.44E-07	9.38E-10
Methylene chloride	3.60E-02	3.16E-05
PCBs	4.12E-06	5.49E-09
Silver	1.01E-04	6.02E-08
Arsenic	3.56E-06	4.34E-09
Barium	5.65E-04	3.78E-06
Cadmium	5.60E-03	9.55E-07
Cl-2-x[c]	1.95E-02	1.41E-05
Cl-3-x[c]	1.34E+00	4.02E-04
Cl-4-x[c]	3.33E-01	1.08E-04
Cl-F-x[d]	1.41E-03	1.17E-05
Chromium	5.34E-03	4.77E-06
HC[e]-insoluble	2.81E+00	4.54E-05
HC-soluble	1.81E+00	1.21E-04
Mercury	4.04E-05	6.93E-08
Lead	1.57E-03	1.03E-05
Selenium	7.63E-05	7.69E-08
Dioxin	1.52E-04	3.02E-08
Furans	1.37E-03	2.71E-07

[a] Data do not include the minor emissions from packaging at sites other than Hanford.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.23 Annual Contaminant Releases to Water at the Hanford Site: CH Non-Alpha LLMW — Case 17, PCB-Contaminated[a]

Contaminant	Annual Releases (unit as indicated)
Radionuclide (Ci/yr)	
H-3	1.68E–04
Fe-55	9.50E–08
Co-60	1.56E–05
Ni-59	2.42E–06
Ni-63	2.55E–04
Sr-90	8.10E–04
Y-90	8.10E–04
Nb-94	1.14E–07
Tc-99	1.01E–05
Sb-125	2.01E–10
Cs-137	9.16E–04
Ba-137m	4.32E–05
Pm-147	5.18E–09
Sm-151	5.64E–07
Eu-154	1.64E–07
Th-234[b]	5.55E–06
U-235	5.73E–11
U-238	5.55E–06
Pu-238	1.83E–06
Pu-239	2.92E–08
Pu-240	4.19E–08
Pu-241	1.82E–06
Am-241	3.00E–08
Chemical contaminant (kg/yr)	
Cyanides	6.27E–09
Methylene chloride	2.37E–09
PCBs	1.80E–09
Silver	3.27E–05
Arsenic	3.82E–06
Barium	2.60E–05
Cadmium	1.74E–06
Cl-2-x[c]	6.72E–09
Cl-3-x[c]	2.65E–07
Cl-4-x[c]	1.50E–08
Cl-F-x[d]	5.45E–09
Chromium	7.36E–05
HC[e]-insoluble	2.26E–07
HC-soluble	1.25E+00
Mercury	1.74E–04
Lead	2.71E–05
Selenium	2.68E–05

[a] Data do not include the minor emissions from aqueous treatment at sites other than Hanford.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.24 Contaminant Concentrations in Grout Solids by Disposal Site: CH Non-Alpha LLMW — Case 2a, Non-PCBs

	Concentration in Grout Solids (unit as indicated)								
	ANL-E			BNL			FEMP		
Contaminant	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	2.47E+00	5.17E-01	1.47E-03	7.60E+00	8.10E-01	4.78E-03	6.54E+01	4.22E+01	3.03E-02
Radionuclide (Ci/m^3)									
H-3	1.0E-04	3.0E-05	2.0E-04	3.13E-03	4.21E-05	1.65E-04	-	-	-
Co-60	3.1E-02	1.0E-01	7.4E-02	3.66E-02	3.94E-03	7.49E-02	-	-	-
Ni-59	5.0E-03	1.7E-02	1.2E-02	5.91E-03	6.36E-04	1.21E-02	-	-	-
Ni-63	5.3E-01	1.7E+00	1.3E-02	6.22E-01	6.69E-02	1.27E+00	-	-	-
Sr-90	7.5E-02	2.8E-01	1.8E-01	8.59E-02	7.66E-02	1.89E-01	-	-	-
Y-90	7.5E-02	2.8E-01	1.8E-01	8.59E-02	7.66E-02	1.89E-01	-	-	-
Nb-94	2.4E-04	7.8E-04	5.6E-04	2.79E-04	3.00E-05	5.69E-04	-	-	-
Tc-99	9.0E-04	3.3E-03	2.1E-03	1.03E-03	9.16E-04	2.26E-03	5.49E-05	7.34E-05	1.52E-04
Cs-137	8.5E-02	3.2E-01	2.0E-01	9.72E-02	8.66E-02	2.14E-01	-	-	-
Ba-137m	8.4E-02	2.8E-01	2.0E-01	9.84E-02	1.06E-02	2.01E-01	-	-	-
Sm-151	1.1E-03	3.6E-03	2.6E-03	1.27E-03	1.36E-04	2.59E-03	-	-	-
Eu-154	3.3E-04	1.1E-03	7.9E-04	3.90E-04	4.19E-05	7.97E-04	-	-	-
Th-234[b]	1.1E-02	3.8E-02	2.7E-02	1.35E-02	1.45E-03	2.75E-02	3.80E-03	4.63E-03	1.08E-02
U-235	-	-	-	-	-	-	2.95E-06	3.60E-06	8.42E-06
U-238	1.1E-02	3.8E-02	2.7E-02	1.35E-02	1.45E-03	2.75E-02	7.15E-03	4.63E-03	1.08E-02
Pu-238	3.5E-03	1.2E-02	8.4E-03	4.14E-03	4.45E-04	8.46E-03	-	-	-
Pu-239	5.7E-05	1.9E-04	1.4E-04	6.68E-05	7.19E-06	1.37E-04	-	-	-
Pu-240	8.5E-05	2.8E-04	2.0E-04	1.00E-04	1.08E-05	2.05E-04	-	-	-
Pu-241	3.7E-03	1.2E-02	8.9E-03	4.38E-03	4.72E-04	8.96E-03	-	-	-
Am-241	5.7E-05	1.9E-04	1.4E-04	1.33E-04	7.19E-06	1.37E-04	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	5.5E-10	5.0E-09	-	6.15E-09	9.61E-06	-	1.07E-07	2.01E-06	-
Methylene chloride	9.6E-04	1.0E-03	-	2.65E-03	2.45E-04	-	2.73E-03	1.17E-04	-
Silver	6.6E-02	4.3E-02	1.9E-01	1.04E-01	8.24E-03	2.16E-01	4.96E-02	1.91E-02	1.31E-01
Arsenic	2.1E-02	1.5E-02	5.0E-01	3.46E-02	1.56E-02	6.08E-01	1.85E-02	6.18E-03	5.12E-01
Barium	1.6E+00	9.0E-01	5.2E+00	2.83E+00	1.57E-01	6.16E+00	1.40E+00	7.77E-01	3.72E+00
Cadmium	5.2E-02	3.6E-02	1.0E-01	1.72E-01	4.13E-02	5.03E-01	4.50E-01	3.54E-02	1.90E+00
Cl-2-x[c]	3.6E-04	5.2E-04	-	2.65E-03	1.97E-04	-	2.45E-03	8.48E-05	-
Cl-3-x[c]	2.5E-03	5.5E-03	-	7.29E-02	1.15E-02	-	9.92E-02	5.54E-03	-
Cl-4-x[c]	1.6E-03	3.8E-03	-	1.47E-03	1.81E-03	-	1.50E-02	1.71E-03	-
Cl-F-x[d]	3.2E-04	6.8E-05	-	3.25E-03	1.43E-04	-	2.51E-03	3.24E-05	-
Chromium	1.9E+00	1.6E-00	5.9E+00	3.64E+00	2.13E-01	7.46E+00	2.51E+00	8.85E-01	6.01E+00
HC-insoluble	3.5E-03	1.5E-02	-	3.30E-01	-	-	3.59E-01	-	-
HC-soluble	6.7E-02	7.7E-03	-	3.32E+00	-	-	3.60E+00	-	-
Mercury	3.1E-01	1.6E-02	7.9E+02	5.22E-01	6.63E-02	9.93E+02	2.39E-01	5.05E-03	6.67E+02
Lead	2.8E+00	4.9E-01	6.9E+00	3.83E+00	2.17E-01	8.37E+00	1.94E+00	2.20E-01	5.08E+00
Selenium	2.7E-01	3.1E-02	8.7E-01	9.67E-01	2.85E-02	1.05E+00	4.16E-01	1.19E-02	6.02E-01

TABLE A.24 Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	Hanford			INEL			LANL		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.20E+03	5.21E+01	4.63E-01	3.83E+01	4.41E+00	1.21E-02	7.94E+00	3.18E+00	4.20E-04
Radionuclide (Ci/m^3)									
H-3	2.89E-02	1.49E-03	2.03E-03	8.61E-01	2.26E-02	1.57E-01	3.60E+00	3.39E-01	8.14E-02
Fe-55	8.12E-03	7.69E-04	1.37E-02	1.59E+00	3.94E+00	4.89E+00	5.43E-03	3.68E-03	7.56E-03
Co-60	6.34E-02	6.15E-03	1.07E-01	1.21E+01	3.02E+01	3.74E+01	4.31E-02	2.92E-02	6.01E-02
Ni-59	2.79E-03	4.89E-04	4.82E-03	1.59E-01	3.94E-01	4.89E-01	7.19E-04	4.87E-04	1.00E-03
Ni-63	3.12E-01	5.27E-02	5.39E-01	2.13E+01	5.30E+01	6.57E+01	9.54E-02	6.47E-02	1.33E-01
Sr-90	8.74E-01	1.17E+00	1.60E+00	7.35E-01	1.96E+00	2.16E+00	2.02E-02	4.71E-02	5.07E-03
Y-90	8.74E-01	1.17E+00	1.60E+00	7.35E-01	1.96E+00	2.16E+00	2.02E-02	4.71E-02	5.07E-03
Nb-94	1.26E-04	2.19E-05	2.18E-04	7.55E-03	1.88E-02	2.33E-02	-	-	-
Tc-99	4.37E-04	5.86E-04	8.02E-04	-	-	-	-	-	-
Sb-125	1.72E-05	1.63E-06	2.89E-05	3.36E-03	8.34E-03	1.03E-02	-	-	-
Cs-137	9.81E-01	1.31E+00	1.80E+00	7.81E-01	2.08E+00	2.29E+00	2.15E-02	5.01E-02	5.40E-03
Ba-137m	9.62E-01	2.00E-01	1.68E+00	7.51E-01	1.87E+00	2.32E+00	3.14E-02	2.13E-02	4.37E-02
Pm-147	4.43E-04	4.19E-05	7.45E-04	8.64E-02	2.15E-01	2.66E-01	3.01E-03	2.04E-03	4.19E-03
Sm-151	1.48E-02	3.08E-03	2.59E-02	6.71E-03	1.67E-02	2.07E-02	2.88E-04	1.95E-04	4.01E-04
Eu-154	1.59E-03	3.26E-04	2.78E-03	9.65E-03	2.40E-02	2.98E-02	3.60E-04	2.44E-04	5.01E-04
Th-234	7.19E-04	1.33E-04	1.25E-03	2.98E-02	7.41E-02	9.18E-02	-	-	-
U-235	-	-	-	-	-	-	-	-	-
U-238	7.19E-04	1.33E-04	1.25E-03	2.98E-02	7.41E-02	9.18E-02	-	-	-
Pu-238	4.60E-02	9.57E-03	8.04E-02	2.48E-02	6.15E-02	7.63E-02	1.24E-03	8.42E-04	1.73E-03
Pu-239	6.21E-04	1.29E-04	1.09E-03	-	-	-	-	-	-
Pu-240	3.54E-04	7.39E-05	6.20E-04	-	-	-	-	-	-
Pu-241	1.03E-02	2.13E-03	1.80E-02	2.55E-02	5.01E-02	6.21E-02	4.77E-03	4.25E-03	8.75E-03
Am-241	1.26E-03	1.82E-04	1.52E-03	-	-	-	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	7.89E-07	1.03E-04	-	1.46E-06	7.29E-05	-	4.10E-07	4.14E-05	-
Methylene chloride	1.82E-03	6.54E-03	-	1.17E-02	4.63E-04	-	2.92E-02	1.35E-04	-
Silver	4.20E-02	1.41E-02	8.57E-02	2.78E-02	2.91E-02	4.54E-02	4.32E-02	2.07E-02	1.19E-01
Arsenic	1.38E-02	1.31E-02	2.80E-01	1.28E-02	1.12E-02	2.91E-01	2.09E-03	5.17E-03	2.50E-02
Barium	1.20E+00	1.01E-01	2.26E+00	1.40E+00	6.47E-01	1.57E+00	1.73E+00	1.46E+00	9.54E-01
Cadmium	4.29E-02	6.98E-03	1.26E-01	2.20E-01	4.84E-02	1.30E+00	1.40E-01	1.13E-02	1.97E-02
Cl-2-x	1.64E-03	3.42E-03	-	5.59E-03	3.33E-04	-	9.87E-03	5.07E-05	-
Cl-3-x	4.87E-02	3.94E-02	-	1.14E-01	1.13E-02	-	4.93E-02	1.96E-03	-
Cl-4-x	8.24E-03	2.64E-02	-	2.84E-02	2.47E-03	-	2.94E-02	1.63E-04	-
Cl-F-x	1.02E-03	1.72E-04	-	5.13E-03	1.90E-04	-	1.22E-02	5.62E-05	-
Chromium	1.34E+00	1.21E-01	2.67E+00	1.90E+00	1.15E+00	2.87E+00	1.12E+00	1.12E+00	1.55E+00
HC-insoluble	1.72E-01	-	-	3.23E-01	-	-	3.38E-03	-	-
HC-soluble	1.77E+00	-	-	3.21E+00	-	-	5.82E-01	-	-
Mercury	1.23E-01	3.39E-02	3.74E+02	1.06E-01	1.00E-02	3.39E+02	4.18E-01	1.05E-02	4.52E+03
Lead	2.31E+00	1.56E-01	3.26E+00	4.51E+00	3.63E-01	2.48E+00	5.17E+00	1.96E-01	2.19E+00
Selenium	1.92E-01	1.33E-02	3.36E-01	7.27E-02	1.93E-02	1.39E-01	6.88E-02	9.49E-03	1.07E-01

TABLE A.24 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	LLNL			NTS			ORR		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.54E+02	2.30E+01	3.02E-02	1.87E+02	2.09E+01	3.07E-02	1.51E+03	5.28E+02	1.02E+00
Radionuclide (Ci/m^3)									
H-3	1.05E+01	3.21E-01	3.33E+00	7.5E-05	4.1E-05	1.5E-04	2.35E-03	2.75E-05	2.76E-04
Fe-55	3.33E-02	1.33E-03	1.70E-01	-	-	-	-	-	-
Co-60	2.68E-01	1.04E-02	1.31E+00	2.3E-02	8.4E-02	6.8E-02	4.89E-02	7.38E-03	9.86E-02
Ni-59	5.42E-03	1.73E-04	1.80E-02	3.6E-03	1.3E-02	1.1E-02	7.89E-03	1.19E-03	1.59E-02
Ni-63	6.68E-01	2.21E-02	2.40E+00	3.8E-01	1.4E+00	1.1E+00	8.31E-01	1.25E-01	1.67E+00
Sr-90	5.43E-02	4.33E-02	1.40E-01	5.7E-02	2.2E-01	1.6E-01	1.02E-01	8.31E-02	2.33E-01
Y-90	5.43E-02	4.33E-02	1.40E-01	5.7E-02	2.2E-01	1.6E-01	1.02E-01	8.31E-02	2.33E-01
Nb-94	2.57E-04	8.22E-06	8.59E-04	1.7E-04	6.4E-04	5.2E-04	3.72E-04	5.62E-05	7.50E-04
Tc-99	3.94E-04	1.31E-05	1.82E-04	6.8E-04	2.6E-03	2.0E-03	1.22E-03	9.94E-04	2.79E-03
Sb-125	7.05E-05	2.82E-06	3.61E-04	-	-	-	-	-	-
Cs-137	5.99E-02	4.54E-02	1.49E-01	6.5E-02	2.4E-01	1.8E-01	1.15E-01	9.40E-02	2.64E-01
Ba-137m	6.22E-02	3.87E-03	1.45E-01	6.1E-02	2.2E-01	1.8E-01	1.31E-01	1.98E-02	2.65E-01
Pm-147	1.82E-03	7.27E-05	9.29E-03	-	-	-	-	-	-
Sm-151	5.91E-04	1.42E-05	9.37E-04	7.8E-04	2.9E-03	2.4E-03	1.69E-03	2.56E-04	3.42E-03
Eu-154	3.41E-04	1.07E-05	1.10E-03	2.4E-04	8.9E-04	7.3E-04	5.21E-04	7.86E-05	1.05E-03
Th-234	8.22E-03	1.00E-03	1.70E-02	8.3E-03	3.1E-02	2.5E-02	1.80E-02	2.72E-03	3.63E-02
U-235	8.68E-09	2.06E-07	3.64E-08	-	-	-	-	-	-
U-238	8.22E-03	1.00E-03	1.70E-02	8.3E-03	3.1E-02	2.5E-02	1.80E-02	2.72E-03	3.63E-02
Pu-238	1.99E-03	4.86E-05	3.36E-03	2.6E-03	9.5E-03	7.7E-03	5.53E-03	8.35E-04	1.11E-02
Pu-239	2.37E-05	4.49E-07	1.14E-05	4.1E-05	1.5E-04	1.2E-04	8.93E-05	1.35E-05	1.80E-04
Pu-240	3.55E-05	6.74E-07	1.70E-05	6.2E-05	2.3E-04	1.9E-04	1.34E-04	2.02E-05	2.70E-04
Pu-241	7.37E-03	6.59E-04	1.42E-02	2.7E-03	1.0E-02	8.2E-03	5.86E-03	8.84E-04	1.18E-02
Am-241	4.71E-05	4.49E-07	1.14E-05	4.1E-05	1.5E-04	1.2E-04	1.68E-04	1.35E-05	1.80E-04
Chemical contaminant (kg/m^3)									
Cyanides	1.25E-07	3.31E-05	-	1.0E-10	1.7E-08	-	1.72E-07	1.16E-05	-
Methylene chloride	8.26E-04	1.78E-04	-	1.4E-06	1.5E-05	-	1.92E-03	2.31E-04	-
Silver	5.70E-02	1.10E-02	1.82E-01	2.3E-02	3.3E-02	1.1E-01	8.73E-02	5.33E-03	1.43E-01
Arsenic	1.61E-02	6.45E-03	5.81E-01	9.2E-03	1.5E-02	3.3E-01	2.76E-02	4.63E-03	4.72E-01
Barium	8.13E-01	6.53E-02	4.90E+00	2.9E-01	7.0E-01	2.3E+00	2.07E+00	7.78E-02	3.96E+00
Cadmium	7.76E-02	3.96E-03	1.60E+00	9.4E-03	2.8E-02	5.4E-02	5.41E-01	5.77E-02	1.44E+00
Cl-2-x	8.02E-04	1.62E-04	-	1.4E-06	1.5E-05	-	1.94E-03	1.57E-04	-
Cl-3-x	2.39E-02	4.24E-03	-	3.1E-05	2.9E-04	-	5.21E-02	1.28E-02	-
Cl-4-x	1.72E-03	6.89E-04	-	2.4E-06	5.2E-05	-	1.43E-03	2.63E-03	-
Cl-F-x	7.91E-04	8.38E-05	-	1.4E-06	1.3E-05	-	2.05E-03	6.09E-05	-
Chromium	9.95E-01	8.40E-02	6.87E+00	3.4E+01	1.2E+00	2.7E+00	2.77E+00	1.51E-01	5.59E+00
HC-insoluble	9.91E-02	-	-	1.4E-04	1.2E-03	-	2.31E-01	-	-
HC-soluble	1.16E+00	-	-	9.4E-05	8.9E-04	-	2.43E+00	-	-
Mercury	1.39E-01	3.84E-02	1.39E+03	4.9E-02	5.8E-03	3.8E+02	3.60E-01	2.02E-02	7.30E+02
Lead	1.19E+00	5.64E-02	6.87E+00	4.1E-01	3.7E-01	3.1E+00	2.97E+00	7.44E-02	5.53E+00
Selenium	2.73E-01	1.25E-02	8.18E-01	4.7E-02	2.1E-02	3.9E-01	6.67E-01	8.43E-03	6.52E-01

TABLE A.24 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	Pantex			PGDP			PORTS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.71E+01	3.18E+00	2.40E-02	7.48E+00	1.42E+01	5.80E-03	5.33E+02	4.75E+01	2.51E-01
Radionuclide (Ci/m^3)									
H-3	6.62E-01	3.22E-02	5.97E-02	2.52E-03	7.82E-06	2.86E-04	-	-	-
Fe-55	5.69E-03	9.80E-04	8.77E-03	7.88E-03	4.45E-05	1.87E-02	-	-	-
Co-60	4.53E-02	7.79E-03	6.97E-02	6.03E-02	3.41E-04	1.43E-01	-	-	-
Ni-59	7.55E-04	1.30E-04	1.16E-03	7.88E-04	4.45E-06	1.87E-03	-	-	-
Ni-63	1.00E-01	1.72E-02	1.54E-01	1.06E-01	5.99E-04	2.51E-01	-	-	-
Sr-90	3.07E-02	1.41E-02	3.97E-02	3.71E-03	2.10E-05	8.79E-03	-	-	-
Y-90	3.07E-02	1.41E-02	3.97E-02	3.71E-03	2.10E-05	8.79E-03	-	-	-
Nb-94	-	-	-	3.75E-05	2.12E-07	8.88E-05	-	-	-
Tc-99	-	-	-	9.51E-01	1.14E-01	2.83E+00	2.65E-04	5.24E-04	2.41E-04
Sb-125	-	-	-	1.67E-05	9.43E-08	3.95E-05	-	-	-
Cs-137	3.26E-02	1.50E-02	4.22E-02	3.94E-03	2.23E-05	9.33E-03	-	-	-
Ba-137m	3.29E-02	5.67E-03	5.07E-02	3.73E-03	2.11E-05	8.83E-03	-	-	-
Pm-147	3.16E-03	5.43E-04	4.86E-03	4.29E-04	2.43E-06	1.02E-03	-	-	-
Sm-151	3.02E-04	5.19E-05	4.65E-04	3.33E-05	1.89E-07	7.90E-05	-	-	-
Eu-154	3.77E-04	6.49E-05	5.81E-04	4.79E-05	2.71E-07	1.14E-04	-	-	-
Th-234	-	-	-	3.71E+00	8.48E-02	1.04E+01	9.54E-04	1.04E-03	1.17E-03
U-235	-	-	-	2.88E-03	6.57E-05	8.05E-03	7.40E-07	8.03E-07	9.04E-07
U-238	-	-	-	6.81E+00	8.48E-02	1.04E+01	6.34E-04	1.04E-03	1.17E-03
Pu-238	1.30E-03	2.24E-04	2.01E-03	1.23E-04	6.95E-07	2.91E-04	-	-	-
Pu-239	-	-	-	-	-	-	-	-	-
Pu-240	-	-	-	-	-	-	-	-	-
Pu-241	1.19E-02	1.13E-03	1.01E-02	1.70E-04	5.66E-07	2.37E-04	-	-	-
Am-241	-	-	-						
Chemical contaminant (kg/m^3)									
Cyanides	1.91E-07	6.78E-06	-	1.58E-06	7.74E-06	-	4.35E-06	2.93E-04	-
Methylene chloride	1.71E-02	1.17E-03	-	2.37E-03	3.05E-04	-	3.45E-03	4.49E-04	-
Silver	1.17E-02	1.08E-03	1.49E-02	6.26E-02	1.12E-03	3.47E-02	6.89E-02	1.90E-02	5.95E-02
Arsenic	2.41E-03	8.41E-04	1.18E-02	2.55E-02	8.13E-04	8.45E-01	2.19E-02	8.46E-03	1.46E-01
Barium	6.06E-01	2.44E-02	5.35E-01	1.71E+00	6.23E-03	1.34E+00	3.80E+00	4.29E-01	2.26E+00
Cadmium	2.23E-01	3.94E-02	6.64E-02	4.37E+00	8.31E-02	1.19E+01	3.21E-02	1.82E-02	6.40E-02
Cl-2-x	6.28E-03	7.57E-04	-	1.99E-03	1.71E-04	-	3.30E-03	4.54E-04	-
Cl-3-x	4.58E-02	1.28E-02	-	2.10E-02	1.71E-02	-	2.82E-02	3.24E-03	-
Cl-4-x	2.07E-02	5.06E-03	-	4.11E-03	3.77E-03	-	7.15E-03	1.26E-03	-
Cl-F-x	7.08E-03	5.08E-04	-	1.33E-03	1.72E-05	-	1.89E-03	2.51E-04	-
Chromium	7.15E-01	4.56E-02	1.47E-01	5.53E+00	8.07E-02	1.11E+01	3.88E+00	6.98E-01	2.44E+00
HC-insoluble	5.95E-02	-	-	6.88E-02	-	-	7.83E-02	-	-
HC-soluble	6.04E-01	-	-	9.96E-01	-	-	8.42E-01	-	-
Mercury	9.09E-02	1.12E-03	1.46E+01	1.26E-01	3.65E-03	3.86E+02	1.81E-01	2.20E-02	3.49E+02
Lead	3.04E+00	3.51E-02	2.48E-01	4.61E+00	2.33E-02	3.96E+00	9.09E+00	3.53E-01	4.34E+00
Selenium	1.43E-02	5.08E-04	8.00E-03	1.96E-01	1.08E-03	1.32E-01	1.40E-01	1.55E-02	1.98E-01

TABLE A.24 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	RFETS			SNL-NM			SRS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	3.81E-02	1.93E-02	1.01E-05	1.30E+00	1.13E-01	1.50E-03	1.99E+02	2.46E+02	1.60E-01
Radionuclide (Ci/m^3)									
H-3	-	-	-	3.42E-01	5.44E-02	5.23E-02	1.07E+00	4.90E-03	4.26E-01
Fe-55	-	-	-	7.80E-03	7.90E-04	9.31E-03	2.08E-02	5.70E-04	5.17E-02
Co-60	-	-	-	3.83E-01	3.76E-02	4.66E-01	6.37E-01	1.35E-02	1.74E+00
Ni-59	-	-	-	3.61E-02	3.52E-03	4.40E-02	5.41E-02	1.05E-03	1.52E-01
Ni-63	-	-	-	4.36E+00	4.25E-01	5.32E+00	6.55E+00	1.28E-01	1.84E+01
Sr-90	-	-	-	2.59E-01	3.70E-02	3.15E-01	3.84E-01	9.10E-03	1.08E+00
Y-90	-	-	-	2.59E-01	3.70E-02	3.15E-01	3.84E-01	9.10E-03	1.08E+00
Nb-94	-	-	-	1.82E-03	1.78E-04	2.22E-03	2.73E-03	5.33E-05	7.67E-03
Tc-99	3.74E-05	1.47E-04	1.22E-04	1.07E-04	1.09E-05	1.31E-04	1.58E-04	3.16E-06	4.45E-04
Sb-125	-	-	-	-	-	-	2.04E-05	7.51E-07	4.25E-05
Cs-137	-	-	-	2.78E-01	3.97E-02	3.39E-01	4.12E-01	9.76E-03	1.16E+00
Ba-137m	-	-	-	2.64E-01	2.59E-02	3.21E-01	3.92E-01	7.60E-03	1.10E+00
Pm-147	-	-	-	9.87E-05	2.69E-05	1.20E-05	5.24E-04	1.93E-05	1.09E-03
Sm-151	-	-	-	3.01E-03	2.95E-04	3.66E-03	4.47E-03	8.64E-05	1.26E-02
Eu-154	-	-	-	1.41E-03	1.39E-04	1.70E-03	2.11E-03	4.16E-05	5.92E-03
Th-234	2.94E-03	8.86E-03	9.49E-03	1.29E-03	1.25E-04	1.57E-03	2.08E-03	4.31E-05	5.73E-03
U-235	2.29E-06	6.89E-06	7.38E-06	-	-	-	-	-	-
U-238	5.41E-03	8.86E-03	9.49E-03	1.29E-03	1.25E-04	1.57E-03	2.08E-03	4.31E-05	5.73E-03
Pu-238	-	-	-	9.48E-03	9.30E-04	1.15E-02	1.41E-02	2.72E-04	3.95E-02
Pu-239	-	-	-	-	-	-	-	-	-
Pu-240	-	-	-	7.51E-03	7.31E-04	9.16E-03	1.11E-02	2.12E-04	3.12E-02
Pu-241	-	-	-	1.02E-02	7.88E-04	9.18E-03	2.11E-02	2.17E-04	3.15E-02
Am-241				-	-	-	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	8.18E-09	2.97E-06	-	3.03E-06	2.12E-04	-	1.54E-07	7.44E-07	-
Methylene chloride	1.69E-04	6.42E-05	-	1.87E-03	6.74E-04	-	8.38E-03	3.36E-04	-
Silver	2.37E-02	3.53E-02	4.33E-02	4.48E-02	2.40E-03	1.59E-02	5.90E-02	2.83E-04	9.85E-02
Arsenic	8.95E-03	9.14E-03	2.57E-01	1.18E-02	1.18E-03	9.53E-03	2.76E-02	1.07E-03	7.88E-01
Barium	1.02E-01	7.56E-01	5.29E-01	2.61E+00	7.33E-02	7.51E-01	1.92E+00	8.11E-03	3.08E+00
Cadmium	2.29E-01	4.62E-02	1.79E+00	7.71E-03	3.69E-04	2.99E-03	3.15E+00	9.10E-02	8.22E+00
Cl-2-x	1.69E-04	4.29E-05	-	1.83E-03	7.33E-04	-	3.87E-03	1.80E-04	-
Cl-3-x	7.59E-03	3.55E-03	-	5.19E-03	2.52E-03	-	5.45E-02	1.86E-02	-
Cl-4-x	1.36E-03	7.69E-04	-	3.24E-03	1.31E-03	-	7.66E-03	4.11E-03	-
Cl-F-x	1.13E-04	1.06E-05	-	9.30E-04	7.90E-04	-	4.56E-03	2.16E-05	-
Chromium	3.28E-01	1.35E+00	2.12E+00	2.41E+00	4.58E-02	3.44E-01	4.79E+00	8.80E-02	1.00E+01
HC-insoluble	2.63E-02	-	-	1.10E-04	-	-	1.94E-01	-	-
HC-soluble	3.35E-01	-	-	6.19E-02	-	-	1.99E+00	-	-
Mercury	1.68E-02	3.28E-03	2.38E+02	7.95E-02	9.09E-03	5.36E+01	3.53E-01	3.03E-03	4.54E+02
Lead	1.88E-01	3.82E-01	9.07E-01	6.02E+00	1.10E-01	9.23E-01	4.11E+00	2.81E-02	5.36E+00
Selenium	3.78E-02	2.14E-02	6.03E-02	1.32E-02	1.69E-03	8.46E-03	5.49E-01	1.30E-03	4.70E-01

TABLE A.24 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)		
	WVDP		
	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	8.85E+00	1.38E+00	3.63E-03
Radionuclide (Ci/m^3)			
H-3	1.09E+00	3.59E-02	8.46E-02
Fe-55	1.57E+00	1.53E-01	3.05E+00
Co-60	1.20E+01	1.17E+00	2.33E+01
Ni-59	1.57E-01	1.54E-02	3.05E-01
Ni-63	2.11E+01	2.06E+00	4.10E+01
Sr-90	7.53E-01	4.00E-01	1.75E+00
Y-90	7.53E-01	4.00E-01	1.75E+00
Nb-94	7.47E-03	7.31E-04	1.45E-02
Tc-99	3.49E-05	1.82E-05	1.76E-04
Sb-125	3.32E-03	3.25E-04	6.45E-03
Cs-137	8.03E-01	4.25E-01	1.88E+00
Ba-137m	8.11E-01	7.80E-02	1.79E+00
Pm-147	8.54E-02	8.36E-03	1.66E-01
Sm-151	7.69E-03	7.31E-04	1.82E-02
Eu-154	9.65E-03	9.42E-04	1.91E-02
Th-234	2.98E-02	2.99E-03	5.86E-02
U-235	2.16E-07	8.53E-08	8.90E-07
U-238	2.98E-02	2.99E-03	5.86E-02
Pu-238	2.78E-02	2.65E-03	6.40E-02
Pu-239	4.46E-05	3.45E-06	2.22E-04
Pu-240	2.54E-05	1.97E-06	1.27E-04
Pu-241	3.41E-02	2.00E-03	4.23E-02
Am-241	1.24E-04	4.84E-06	3.12E-04
Chemical contaminant (kg/m^3)			
Cyanides	1.54E-07	7.44E-07	-
Methylene chloride	8.38E-03	3.36E-04	-
Silver	5.90E-02	2.83E-04	9.85E-02
Arsenic	2.76E-02	1.07E-03	7.88E-01
Barium	1.92E+00	8.11E-03	3.08E+00
Cadmium	3.15E+00	9.10E-02	8.22E+00
Cl-2-x	3.87E-03	1.80E-04	-
Cl-3-x	5.45E-02	1.86E-02	-
Cl-4-x	7.66E-03	4.11E-03	-
Cl-F-x	4.56E-03	2.16E-05	-
Chromium	4.79E+00	8.80E-02	1.00E+01
HC-insoluble	1.94E-01	-	-
HC-soluble	1.99E+00	-	-
Mercury	3.53E-01	3.03E-03	4.54E+02
Lead	4.11E+00	2.81E-02	5.36E+00
Selenium	5.49E-01	1.30E-03	4.70E-01

[a] Mercury solids are assumed to be a metal amalgam.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.25 Contaminant Concentrations in Grout Solids by Disposal Site: CH Non-Alpha LLMW — Case 4, Non-PCBs

	Concentration in Grout Solids (unit as indicated)								
	FEMP			Hanford			INEL		
Contaminant	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	6.54E+01	4.22E+01	3.03E-02	1.20E+03	5.21E+01	4.63E-01	3.83E+01	4.41E+00	1.21E-02
Radionuclide (Ci/m^3)									
H-3	-	-	-	2.89E-02	1.49E-03	2.03E-03	8.61E-01	2.26E-02	1.57E-01
Fe-55	-	-	-	8.12E-03	7.69E-04	1.37E-02	1.59E+00	3.94E+00	4.89E+00
Co-60	-	-	-	6.34E-02	6.15E-03	1.07E-01	1.21E+01	3.02E+01	3.74E+01
Ni-59	-	-	-	2.79E-03	4.89E-04	4.82E-03	1.59E-01	3.94E-01	4.89E-01
Ni-63	-	-	-	3.12E-01	5.27E-02	5.39E-01	2.13E+01	5.30E+01	6.57E+01
Sr-90	-	-	-	8.74E-01	1.17E+00	1.60E+00	7.35E-01	1.96E+00	2.16E+00
Y-90	-	-	-	8.74E-01	1.17E+00	1.60E+00	7.35E-01	1.96E+00	2.16E+00
Nb-94	-	-	-	1.26E-04	2.19E-05	2.18E-04	7.55E-03	1.88E-02	2.33E-02
Tc-99	5.49E-05	7.34E-05	1.52E-04	4.37E-04	5.86E-04	8.02E-04	-	-	-
Sb-125	-	-	-	1.72E-05	1.63E-06	2.89E-05	3.36E-03	8.34E-03	1.03E-02
Cs-137	-	-	-	9.81E-01	1.31E+00	1.80E+00	7.81E-01	2.08E+00	2.29E+00
Ba-137m	-	-	-	9.62E-01	2.00E-01	1.68E+00	7.51E-01	1.87E+00	2.32E+00
Pm-147	-	-	-	4.43E-04	4.19E-05	7.45E-04	8.64E-02	2.15E-01	2.66E-01
Sm-151	-	-	-	1.48E-02	3.08E-03	2.59E-02	6.71E-03	1.67E-02	2.07E-02
Eu-154	-	-	-	1.59E-03	3.26E-04	2.78E-03	9.65E-03	2.40E-02	2.98E-02
Th-234[b]	-	-	-	7.19E-04	1.33E-04	1.25E-03	2.98E-02	7.41E-02	9.18E-02
U-235	3.80E-03	4.63E-03	1.08E-02	-	-	-	-	-	-
U-238	2.95E-06	3.60E-06	8.42E-06	7.19E-04	1.33E-04	1.25E-03	2.98E-02	7.41E-02	9.18E-02
Pu-238	7.15E-03	4.63E-03	1.08E-02	4.60E-02	9.57E-03	8.04E-02	2.48E-02	6.15E-02	7.63E-02
Pu-239	-	-	-	6.21E-04	1.29E-04	1.09E-03	-	-	-
Pu-240	-	-	-	3.54E-04	7.39E-05	6.20E-04	-	-	-
Pu-241	-	-	-	1.03E-02	2.13E-03	1.80E-02	2.55E-02	5.01E-02	6.21E-02
Am-241	-	-	-	1.26E-03	1.82E-04	1.52E-03	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	1.07E-07	2.01E-06	-	7.89E-07	1.03E-04	-	1.46E-06	7.29E-05	-
Methylene chloride	2.73E-03	1.17E-04	-	1.82E-03	6.54E-03	-	1.17E-02	4.63E-04	-
Silver	4.96E-02	1.91E-02	1.31E-01	4.20E-02	1.41E-02	8.57E-02	2.78E-02	2.91E-02	4.54E-02
Arsenic	1.85E-02	6.18E-03	5.12E-01	1.38E-02	1.31E-02	2.80E-01	1.28E-02	1.12E-02	2.91E-01
Barium	1.40E+00	7.77E-01	3.72E+00	1.20E+00	1.01E-01	2.26E+00	1.40E+00	6.47E-01	1.57E+00
Cadmium	4.50E-01	3.54E-02	1.90E+00	4.29E-02	6.98E-03	1.26E-01	2.20E-01	4.84E-02	1.30E+00
Cl-2-x[c]	2.45E-03	8.48E-05	-	1.64E-03	3.42E-03	-	5.59E-03	3.33E-04	-
Cl-3-x[c]	9.92E-02	5.54E-03	-	4.87E-02	3.94E-02	-	1.14E-01	1.13E-02	-
Cl-4-x[c]	1.50E-02	1.71E-03	-	8.24E-03	2.64E-02	-	2.84E-02	2.47E-03	-
Cl-F-x[d]	2.51E-03	3.24E-05	-	1.02E-03	1.72E-04	-	5.13E-03	1.90E-04	-
Chromium	2.51E+00	8.85E-01	6.01E+00	1.34E+00	1.21E-01	2.67E+00	1.90E+00	1.15E+00	2.87E+00
HC[e]-insoluble	3.59E-01	-	-	1.72E-01	-	-	3.23E-01	-	-
HC-soluble	3.60E+00	-	-	1.77E+00	-	-	3.21E+00	-	-
Mercury	2.39E-01	5.05E-03	6.67E+02	1.23E-01	3.39E-02	3.74E+02	1.06E-01	1.00E-02	3.39E+02
Lead	1.94E+00	2.20E-01	5.08E+00	2.31E+00	1.56E-01	3.26E+00	4.51E+00	3.63E-01	2.48E+00
Selenium	4.16E-01	1.19E-02	6.02E-01	1.92E-01	1.33E-02	3.36E-01	7.27E-02	1.93E-02	1.39E-01

TABLE A.25 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	LANL			LLNL			ORR		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	9.24E+00	3.30E+00	1.92E-03	1.54E+02	2.30E+01	3.02E-02	1.51E+03	5.28E+02	1.02E+00
Radionuclide (Ci/m^3)									
H-3	3.15E+00	3.29E-01	5.87E-02	1.05E+01	3.21E-01	3.33E+00	2.35E-03	2.75E-05	2.76E-04
Fe-55	5.76E-03	3.58E-03	8.93E-03	3.33E-02	1.33E-03	1.70E-01	-	-	-
Co-60	9.09E-02	2.95E-02	3.77E-01	2.68E-01	1.04E-02	1.31E+00	4.89E-02	7.38E-03	9.86E-02
Ni-59	5.68E-03	5.92E-04	3.46E-02	5.42E-03	1.73E-04	1.80E-02	7.89E-03	1.19E-03	1.59E-02
Ni-63	6.94E-01	7.71E-02	4.18E+00	6.68E-01	2.21E-02	2.40E+00	8.31E-01	1.25E-01	1.67E+00
Sr-90	5.36E-02	4.68E-02	2.48E-01	5.43E-02	4.33E-02	1.40E-01	1.02E-01	8.31E-02	2.33E-01
Y-90	5.36E-02	4.68E-02	2.48E-01	5.43E-02	4.33E-02	1.40E-01	1.02E-01	8.31E-02	2.33E-01
Nb-94	2.56E-04	6.11E-06	1.74E-03	2.57E-04	8.22E-06	8.59E-04	3.72E-04	5.62E-05	7.50E-04
Tc-99	1.50E-05	3.75E-07	1.02E-04	3.94E-04	1.31E-05	1.82E-04	1.22E-03	9.94E-04	2.79E-03
Sb-125	-	-	-	7.05E-05	2.82E-06	3.61E-04	-	-	-
Cs-137	5.75E-02	4.98E-02	2.66E-01	5.99E-02	4.54E-02	1.49E-01	1.15E-01	9.40E-02	2.64E-01
Ba-137m	6.40E-02	2.14E-02	2.60E-01	6.22E-02	3.87E-03	1.45E-01	1.31E-01	1.98E-02	2.65E-01
Pm-147	2.60E-03	1.97E-03	9.24E-04	1.82E-03	7.27E-05	9.29E-03	-	-	-
Sm-151	6.70E-04	1.98E-04	2.95E-03	5.91E-04	1.42E-05	9.37E-04	1.69E-03	2.56E-04	3.42E-03
Eu-154	5.06E-04	2.40E-04	1.44E-03	3.41E-04	1.07E-05	1.10E-03	5.21E-04	7.86E-05	1.05E-03
Th-234	1.81E-04	4.31E-06	1.23E-03	8.22E-03	1.00E-03	1.70E-02	1.80E-02	2.72E-03	3.63E-02
U-235	-	-	-	8.68E-09	2.06E-07	3.64E-08	-	-	-
U-238	1.81E-04	4.31E-06	1.23E-03	8.22E-03	1.00E-03	1.70E-02	1.80E-02	2.72E-03	3.63E-02
Pu-238	2.40E-03	8.45E-04	9.38E-03	1.99E-03	4.86E-05	3.36E-03	5.53E-03	8.35E-04	1.11E-02
Pu-239	-	-	-	2.37E-05	4.49E-07	1.14E-05	8.93E-05	1.35E-05	1.80E-04
Pu-240	1.05E-03	2.51E-05	7.16E-03	3.55E-05	6.74E-07	1.70E-05	1.34E-04	2.02E-05	2.70E-04
Pu-241	5.56E-03	4.13E-03	9.09E-03	4.73E-03	6.59E-04	1.42E-02	5.86E-03	8.84E-04	1.18E-02
Am-241	-	-	-	4.73E-05	4.49E-07	1.14E-05	1.68E-04	1.35E-05	1.80E-04
Chemical contaminant (kg/m^3)									
Cyanides	7.78E-07	4.73E-05	-	1.25E-07	3.31E-05	-	1.72E-07	1.16E-05	-
Methylene chloride	2.54E-02	1.53E-04	-	8.26E-04	1.78E-04	-	1.92E-03	2.31E-04	-
Silver	4.34E-02	2.01E-02	3.85E-02	5.69E-02	1.10E-02	1.82E-01	8.73E-02	5.33E-03	1.43E-01
Arsenic	3.46E-03	5.04E-03	1.29E-02	1.61E-02	6.45E-03	5.81E-01	2.76E-02	4.63E-03	4.72E-01
Barium	1.85E+00	1.42E+00	7.96E-01	8.13E-01	6.53E-02	4.90E+00	2.07E+00	7.78E-02	3.96E+00
Cadmium	1.21E-01	1.09E-02	6.64E-03	7.76E-02	3.96E-03	1.60E+00	5.41E-01	5.77E-02	1.44E+00
Cl-2-x	8.74E-03	7.41E-05	-	8.02E-04	1.62E-04	-	1.94E-03	1.57E-04	-
Cl-3-x	4.31E-02	1.98E-03	-	2.39E-02	4.24E-03	-	5.21E-02	1.28E-02	-
Cl-4-x	2.57E-02	2.02E-04	-	1.72E-03	6.89E-04	-	1.43E-03	2.63E-03	-
Cl-F-x	1.06E-02	8.14E-05	-	7.91E-04	8.38E-05	-	2.05E-03	6.09E-05	-
Chromium	1.30E+00	1.08E+00	6.08E-01	9.95E-01	8.40E-02	6.87E+00	2.77E+00	1.51E-01	5.59E+00
HC-insoluble	2.93E-03	-	-	9.91E-02	-	-	2.31E-01	-	-
HC-soluble	5.09E-01	-	-	1.16E+00	-	-	2.43E+00	-	-
Mercury	3.71E-01	1.04E-02	1.03E+03	1.39E-01	3.84E-02	1.39E+03	3.60E-01	2.02E-02	7.30E+02
Lead	5.29E+00	1.93E-01	1.20E+00	1.19E+00	5.64E-02	6.87E+00	2.97E+00	7.44E-02	5.53E+00
Selenium	6.15E-02	9.22E-03	3.00E-02	2.73E-01	1.25E-02	8.18E-01	6.67E-01	8.43E-03	6.52E-01

TABLE A.25 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	Pantex			PGDP			PORTS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.71E+01	3.18E+00	2.40E-02	7.48E+00	1.42E+01	5.81E-03	1.12E+03	5.66E+01	3.29-01
Radionuclide (Ci/m^3)									
H-3	6.62E-01	3.22E-02	5.97E-02	2.52E-03	7.82E-06	2.86E-04	1.03E-02	8.93E-04	9.62E-04
Fe-55	5.69E-03	9.80E-04	8.77E-03	7.88E-03	4.45E-05	1.87E-02	1.24E-02	3.76E-03	3.36E-02
Co-60	4.53E-02	7.79E-03	6.97E-02	6.03E-02	3.41E-04	1.43E-01	1.07E-01	2.97E-02	2.73E-01
Ni-59	7.55E-04	1.30E-04	1.16E-03	7.88E-04	4.45E-06	1.87E-03	3.15E-03	5.31E-04	5.88E-03
Ni-63	1.00E-01	1.72E-02	1.54E-01	1.06E-01	5.99E-04	2.51E-01	3.68E-01	6.69E-02	7.17E-01
Sr-90	3.07E-02	1.41E-02	3.97E-02	3.71E-03	2.10E-05	8.79E-03	3.60E-02	1.45E-02	5.89E-02
Y-90	3.07E-02	1.41E-02	3.97E-02	3.71E-03	2.10E-05	8.79E-03	3.60E-02	1.45E-02	5.89E-02
Nb-94	-	-	-	3.75E-05	2.12E-07	8.88E-05	1.49E-04	2.52E-05	2.79E-04
Tc-99	-	-	-	9.51E-01	1.14E-01	2.83E+00	4.86E-04	4.97E-04	6.58E-04
Sb-125	-	-	-	1.67E-05	9.43E-08	3.95E-05	2.62E-05	7.95E-06	7.12E-05
Cs-137	3.26E-02	1.50E-02	4.22E-02	3.94E-03	2.23E-05	9.33E-03	4.03E-02	1.58E-02	6.55E-02
Ba-137m	3.29E-02	5.67E-03	5.07E-02	3.73E-03	2.11E-05	8.83E-03	3.83E-02	4.49E-03	6.15E-02
Pm-147	3.16E-03	5.43E-04	4.86E-03	4.29E-04	2.43E-06	1.02E-03	6.75E-04	2.05E-04	1.83E-03
Sm-151	3.02E-04	5.19E-05	4.65E-04	3.34E-05	1.89E-07	7.90E-05	4.72E-04	5.12E-05	7.40E-04
Eu-154	3.77E-04	6.49E-05	5.81E-04	4.79E-05	2.71E-07	1.14E-04	2.03E-04	3.33E-05	3.76E-04
Th-234	-	-	-	3.71E+00	8.48E-02	1.04E+01	5.05E-03	1.30E-03	7.26E-03
U-235	-	-	-	2.88E-03	6.57E-05	8.05E-03	3.54E-07	6.76E-07	7.00E-07
U-238	-	-	-	3.71E+00	8.48E-02	1.04E+01	4.90E-03	1.30E-03	7.26E-03
Pu-238	1.30E-03	2.24E-04	2.01E-03	1.23E-04	6.95E-07	2.91E-04	1.56E-03	1.74E-04	2.47E-03
Pu-239	-	-	-	-	-	-	2.20E-05	1.84E-06	3.09E-05
Pu-240	-	-	-	-	-	-	3.27E-05	2.68E-06	4.40E-05
Pu-241	1.19E-02	1.13E-03	1.01E-02	1.70E-04	5.66E-07	2.37E-04	1.69E-03	1.64E-04	2.33E-03
Am-241	-	-	-	-	-	-	4.40E-05	1.88E-06	3.19E-05
Chemical contaminant (kg/m^3)									
Cyanides	1.91E-07	6.78E-06	-	1.58E-06	7.74E-06	-	2.07E-06	2.46E-04	-
Methylene chloride	1.71E-02	1.17E-03	-	2.37E-03	3.05E-04	-	2.37E-03	4.40E-04	-
Silver	1.17E-02	1.08E-03	1.49E-02	6.26E-02	1.12E-03	3.47E-02	4.81E-02	1.76E-02	8.93E-02
Arsenic	2.41E-03	8.41E-04	1.18E-02	2.55E-02	8.13E-04	8.45E-01	1.65E-02	1.13E-02	2.34E-01
Barium	6.06E-01	2.44E-02	5.35E-01	1.71E+00	6.23E-03	1.34E+00	2.08E+00	3.93E-01	2.93E+00
Cadmium	2.23E-01	3.94E-02	6.64E-02	4.37E+00	8.31E-02	1.19E+01	2.67E-02	1.74E-02	8.90E-02
Cl-2-x	6.28E-03	7.57E-04	-	1.99E-03	1.71E-04	-	1.97E-03	4.23E-04	-
Cl-3-x	4.58E-02	1.28E-02	-	2.10E-02	1.71E-02	-	2.12E-02	3.74E-03	-
Cl-4-x	2.07E-02	5.06E-03	-	4.11E-03	3.77E-03	-	4.15E-03	1.24E-03	-
Cl-F-x	7.08E-03	5.08E-04	-	1.33E-03	1.72E-05	-	1.37E-03	2.45E-04	-
Chromium	7.15E-01	4.56E-02	1.47E-01	5.53E+00	8.07E-02	1.11E+01	2.17E+00	6.24E-01	3.26E+00
HC-insoluble	5.95E-02	-	-	6.88E-02	-	-	6.78E-02	-	-
HC-soluble	6.04E-01	-	-	9.96E-01	-	-	7.08E-01	-	-
Mercury	9.09E-02	1.12E-03	1.46E+01	1.26E-01	3.65E-03	3.86E+02	1.38E-01	2.99E-02	4.56E+02
Lead	3.04E+00	3.51E-02	2.48E-01	4.61E+00	2.33E-02	3.96E+00	4.78E+00	3.39E-01	4.95E+00
Selenium	1.43E-02	5.08E-04	8.00E-03	1.96E-01	1.08E-03	1.32E-01	1.56E-01	1.82E-02	3.55E-01

TABLE A.25 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)					
	RFETS			SRS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	3.81E-02	1.93E-02	1.01E-05	1.99E+02	2.46E+02	1.60E-01
Radionuclide (Ci/m^3)						
H-3	-	-	-	1.07E+00	4.90E-03	4.26E-01
Fe-55	-	-	-	2.08E-02	5.70E-04	5.17E-02
Co-60	-	-	-	6.37E-01	1.35E-02	1.74E+00
Ni-59	-	-	-	5.41E-02	1.05E-03	1.52E-01
Ni-63	-	-	-	6.55E+00	1.28E-01	1.84E+01
Sr-90	-	-	-	3.84E-01	9.10E-03	1.08E+00
Y-90	-	-	-	3.84E-01	9.10E-03	1.08E+00
Nb-94	-	-	-	2.73E-03	5.33E-05	7.67E-03
Tc-99	3.74E-05	1.47E-04	1.22E-04	1.58E-04	3.16E-06	4.45E-04
Sb-125	-	-	-	2.04E-05	7.51E-07	4.25E-05
Cs-137	-	-	-	4.12E-01	9.76E-03	1.16E+00
Ba-137m	-	-	-	3.92E-01	7.60E-03	1.10E+00
Pm-147	-	-	-	5.24E-04	1.93E-05	1.09E-03
Sm-151	-	-	-	4.47E-03	8.64E-05	1.26E-02
Eu-154	-	-	-	2.11E-03	4.16E-05	5.92E-03
Th-234	2.94E-03	8.86E-03	9.49E-03	2.08E-03	4.31E-05	5.73E-03
U-235	2.29E-06	6.89E-06	7.38E-06	-	-	-
U-238	5.38E-03	8.86E-03	9.49E-03	2.08E-03	4.31E-05	5.73E-03
Pu-238	-	-	-	1.41E-02	2.72E-04	3.95E-02
Pu-239	-	-	-	1.11E-02	2.12E-04	3.12E-02
Pu-240	-	-	-	2.11E-02	2.17E-04	3.15E-02
Pu-241	-	-	-	-	-	-
Chemical contaminant (kg/m^3)						
Cyanides	8.18E-09	2.97E-06	-	1.54E-07	7.44E-07	-
Methylene chloride	1.69E-04	6.42E-05	-	8.38E-03	3.36E-04	-
Silver	2.37E-02	3.53E-02	4.33E-02	5.90E-02	2.83E-04	9.85E-02
Arsenic	8.95E-03	9.14E-03	2.57E-01	2.76E-02	1.07E-03	7.88E-01
Barium	1.02E-01	7.56E-01	5.29E-01	1.92E+00	8.11E-03	3.08E+00
Cadmium	2.29E-01	4.62E-02	1.79E+00	3.15E+00	9.10E-02	8.22E+00
Cl-2-x	1.69E-04	4.29E-05	-	3.87E-03	1.80E-04	-
Cl-3-x	7.59E-03	3.55E-03	-	5.45E-02	1.86E-02	-
Cl-4-x	1.36E-03	7.69E-04	-	7.66E-03	4.11E-03	-
Cl-F-x	1.13E-04	1.06E-05	-	4.56E-03	2.16E-05	-
Chromium	3.28E-01	1.35E+00	2.12E+00	4.79E+00	8.80E-02	1.00E+01
HC-insoluble	2.63E-02	-	-	1.94E-01	-	-
HC-soluble	3.35E-01	-	-	1.99E+00	-	-
Mercury	1.68E-02	3.28E-03	2.38E+02	3.53E-01	3.03E-03	4.54E+02
Lead	1.88E-01	3.82E-01	9.07E-01	4.11E+00	2.81E-02	5.36E+00
Selenium	3.77E-02	2.14E-02	6.03E-02	5.49E-01	1.30E-03	4.70E-01

[a] Mercury solids are assumed to be a metal amalgam.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.26 Contaminant Concentrations in Grout Solids by Disposal Site: CH Non-Alpha LLMW — Case 7, Non-PCBs

	Concentration in Grout Solids (unit as indicated)								
	Hanford			INEL			LANL		
Contaminant	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.26E+03	7.38E+01	4.90E-01	1.34E+02	5.29E+00	1.50E-02	2.64E+01	6.49E+00	2.59E-02
Radionuclide (Ci/m^3)									
H-3	1.31E+00	1.01E-01	2.07E-01	2.49E-01	1.88E-02	1.28E-01	1.53E+00	1.83E-01	5.96E-02
Fe-55	1.18E-02	9.59E-04	2.34E-02	4.55E-01	3.28E+00	3.97E+00	7.93E-03	2.39E-03	1.29E-02
Co-60	9.16E-02	7.53E-03	1.81E-01	3.49E+00	2.51E+01	3.03E+01	7.82E-02	1.95E-02	1.24E-01
Ni-59	3.07E-03	3.87E-04	5.61E-03	4.79E-02	3.28E-01	3.98E-01	2.70E-03	3.74E-04	4.06E-03
Ni-63	3.52E-01	4.29E-02	6.51E-01	6.37E+00	4.42E+01	5.35E+01	3.38E-01	4.89E-02	5.10E-01
Sr-90	8.36E-01	8.38E-01	1.52E+00	2.49E-01	1.63E+00	1.78E+00	3.97E-02	3.07E-02	5.71E-02
Y-90	8.36E-01	8.38E-01	1.52E+00	2.49E-01	1.63E+00	1.78E+00	3.97E-02	3.07E-02	5.71E-02
Nb-94	1.40E-04	1.75E-05	2.56E-04	2.28E-03	1.56E-02	1.90E-02	1.00E-04	3.56E-06	1.49E-04
Tc-99	4.17E-04	4.14E-04	7.58E-04	4.52E-04	3.06E-05	3.38E-04	5.32E-06	6.26E-07	7.64E-06
Sb-125	2.50E-05	2.03E-06	4.95E-05	9.62E-04	6.95E-03	8.39E-03	4.72E-06	2.07E-07	8.85E-06
Cs-137	9.38E-01	9.40E-01	1.71E+00	2.66E-01	1.74E+00	1.89E+00	4.24E-02	3.26E-02	6.09E-02
Ba-137m	9.20E-01	1.42E-01	1.60E+00	2.55E-01	1.56E+00	1.91E+00	4.48E-02	1.37E-02	6.82E-02
Pm-147	6.44E-04	5.23E-05	1.28E-03	2.48E-02	1.79E-01	2.16E-01	3.08E-03	1.27E-03	4.79E-03
Sm-151	1.41E-02	2.18E-03	2.45E-02	2.44E-03	1.39E-02	1.72E-02	4.39E-04	1.27E-04	6.67E-04
Eu-154	1.54E-03	2.33E-04	2.69E-03	2.93E-03	2.00E-02	2.42E-02	4.35E-04	1.54E-04	6.70E-04
Th-234[b]	1.11E-03	2.98E-04	2.09E-03	1.40E-02	6.20E-02	7.86E-02	1.09E-04	3.03E-05	1.73E-04
U-235	-	-	-	9.75E-09	2.44E-09	4.94E-08	3.30E-09	2.05E-08	2.87E-09
U-238	1.11E-03	2.98E-04	2.09E-03	1.40E-02	6.20E-02	7.86E-02	1.09E-04	3.03E-05	1.73E-04
Pu-238	4.39E-02	6.77E-03	7.61E-02	8.78E-03	5.13E-02	6.32E-02	1.72E-03	5.40E-04	2.62E-03
Pu-239	5.92E-04	9.15E-05	1.03E-03	2.71E-05	1.75E-06	2.02E-05	-	-	-
Pu-240	3.38E-04	5.22E-05	5.85E-04	4.07E-05	2.63E-06	3.04E-05	3.68E-04	1.28E-05	5.32E-04
Pu-241	1.02E-02	1.70E-03	1.78E-02	7.55E-03	4.18E-02	5.17E-02	9.54E-03	2.65E-03	1.01E-02
Am-241	1.20E-03	1.28E-04	1.44E-03	5.41E-05	1.75E-06	2.02E-05	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	7.66E-07	8.33E-05	-	4.30E-07	6.26E-05	-	3.96E-07	2.73E-05	-
Methylene chloride	1.83E-03	4.67E-03	-	3.39E-03	3.92E-04	-	2.00E-02	6.50E-04	-
Silver	4.60E-02	1.30E-02	9.18E-02	1.81E-02	2.49E-02	4.53E-02	2.28E-02	1.08E-02	1.66E-02
Arsenic	1.46E-02	1.10E-02	2.99E-01	8.61E-03	1.22E-02	2.73E-01	2.78E-03	2.99E-03	1.20E-02
Barium	1.24E+00	8.43E-02	2.43E+00	4.30E-01	5.41E-01	1.34E+00	1.04E+00	7.32E-01	5.55E-01
Cadmium	5.00E-02	5.86E-03	2.18E-01	6.67E-02	4.06E-02	1.06E+00	1.88E-01	2.50E-02	6.26E-02
Cl-2-x[c]	1.66E-03	2.46E-03	-	1.63E-03	2.84E-04	-	7.14E-03	4.08E-04	-
Cl-3-x[c]	4.93E-02	2.92E-02	-	3.38E-02	9.58E-03	-	4.48E-02	7.26E-03	-
Cl-4-x[c]	8.02E-03	1.89E-02	-	8.54E-03	2.11E-03	-	2.24E-02	2.58E-03	-
Cl-F-x[d]	1.07E-03	1.48E-04	-	1.49E-03	1.62E-04	-	8.31E-03	2.90E-04	-
Chromium	1.39E+00	9.92E-02	2.95E+00	5.80E-01	9.57E-01	2.41E+00	9.20E-01	5.74E-01	1.82E-01
HC[e]-insoluble	1.76E-01	-	-	9.53E-02	-	-	3.96E-02	-	-
HC-soluble	1.83E+00	-	-	9.50E-01	-	-	5.70E-01	-	-
Mercury	1.33E-01	3.59E-02	4.38E+02	3.50E-02	9.02E-03	2.95E+02	1.89E-01	5.85E-03	8.99E+01
Lead	2.34E+00	1.24E-01	3.50E+00	1.36E+00	3.06E-01	2.12E+00	3.83E+00	1.16E-01	3.19E-01
Selenium	2.16E-01	1.31E-02	3.67E-01	2.49E-02	1.63E-02	1.20E-01	3.08E-02	4.99E-03	9.66E-03

TABLE A.26 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	NTS			ORR			SRS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	6.99E-03	4.92E-01	1.04E-05	2.70E+03	6.41E+02	1.38E+00	1.99E+02	2.46E+02	1.60E-01
Radionuclide (Ci/m^3)									
H-3	-	-	-	5.59E-03	1.01E-04	4.31E-04	1.07E+00	4.90E-03	4.26E-01
Fe-55	-	-	-	5.13E-03	3.31E-04	7.99E-03	2.08E-02	5.70E-04	5.17E-02
Co-60	1.16E-01	7.48E-04	7.53E-01	7.15E-02	8.70E-03	1.37E-01	6.37E-01	1.35E-02	1.74E+00
Ni-59	1.86E-02	1.21E-04	1.22E-01	5.72E-03	1.03E-03	1.31E-02	5.41E-02	1.05E-03	1.52E-01
Ni-63	1.96E+00	1.27E-02	1.28E+01	6.17E-01	1.09E-01	1.40E+00	6.55E+00	1.28E-01	1.84E+01
Sr-90	1.65E-02	6.56E-03	-	7.18E-02	6.97E-02	1.86E-01	3.84E-01	9.10E-03	1.08E+00
Y-90	1.65E-02	6.56E-03	-	7.18E-02	6.97E-02	1.86E-01	3.84E-01	9.10E-03	1.08E+00
Nb-94	8.79E-04	5.69E-06	5.73E-03	2.70E-04	4.85E-05	6.18E-04	2.73E-03	5.33E-05	7.67E-03
Tc-99	2.03E-04	2.67E-04	-	3.51E-03	3.39E-03	1.41E-02	1.58E-04	3.16E-06	4.45E-04
Sb-125	-	-	-	1.09E-05	7.01E-07	1.69E-05	2.04E-05	7.51E-07	4.25E-05
Cs-137	1.86E-02	7.42E-03	-	8.10E-02	7.88E-02	2.10E-01	4.12E-01	9.76E-03	1.16E+00
Ba-137m	3.10E-01	2.01E-03	2.02E+00	8.93E-02	1.67E-02	2.10E-01	3.92E-01	7.60E-03	1.10E+00
Pm-147	-	-	-	2.80E-04	1.81E-05	4.35E-04	5.24E-04	1.93E-05	1.09E-03
Sm-151	4.00E-03	2.59E-05	2.61E-02	1.14E-03	2.15E-04	2.69E-03	4.47E-03	8.64E-05	1.26E-02
Eu-154	1.23E-03	7.96E-06	8.02E-03	3.75E-04	6.77E-05	8.62E-04	2.11E-03	4.16E-05	5.92E-03
Th-234	4.84E-02	1.26E-02	3.21E-01	2.25E-02	4.54E-03	7.22E-02	2.08E-03	4.31E-05	5.73E-03
U-235	4.59E-06	9.60E-06	3.46E-05	8.19E-06	1.76E-06	3.41E-05	-	-	-
U-238	4.84E-02	1.26E-02	3.21E-01	2.25E-02	4.54E-03	7.22E-02	2.08E-03	4.31E-05	5.73E-03
Pu-238	1.31E-02	8.45E-05	8.52E-02	3.74E-03	7.03E-04	8.79E-03	1.41E-02	2.72E-04	3.95E-02
Pu-239	2.11E-04	1.36E-06	1.38E-03	5.90E-05	1.13E-05	1.40E-04	-	-	-
Pu-240	3.16E-04	2.05E-06	2.06E-03	8.84E-05	1.69E-05	2.09E-04	1.11E-02	2.12E-04	3.12E-02
Pu-241	1.38E-02	8.95E-05	9.02E-02	3.93E-03	7.43E-04	9.25E-03	2.11E-02	2.17E-04	3.15E-02
Am-241	2.11E-04	1.36E-06	1.38E-03	1.12E-04	1.13E-05	1.40E-04	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	3.15E-09	2.43E-09	-	9.62E-07	3.16E-05	-	1.54E-07	7.44E-07	-
Methylene chloride	3.55E-06	2.47E-06	-	2.12E-03	2.43E-04	-	8.38E-03	3.36E-04	-
Silver	3.04E-02	4.83E-02	2.22E-01	7.01E-02	7.23E-03	1.30E-01	5.90E-02	2.83E-04	9.85E-02
Arsenic	1.20E-02	1.16E-02	8.37E-02	2.28E-02	5.23E-03	4.18E-01	2.76E-02	1.07E-03	7.88E-01
Barium	5.12E-01	1.06E+00	3.85E+00	2.06E+00	1.50E-01	3.70E+00	1.92E+00	8.11E-03	3.08E+00
Cadmium	6.15E-02	4.32E-02	4.22E-01	3.36E-01	5.32E-02	1.17E+00	3.15E+00	9.10E-02	8.22E+00
Cl-2-x	1.30E-05	2.64E-06	-	1.97E-03	1.76E-04	-	3.87E-03	1.80E-04	-
Cl-3-x	1.74E-05	5.26E-06	-	4.04E-02	1.16E-02	-	5.45E-02	1.86E-02	-
Cl-4-x	2.11E-05	1.48E-05	-	2.90E-03	2.48E-03	-	7.66E-03	4.11E-03	-
Cl-F-x	1.77E-06	1.24E-06	-	1.78E-03	7.43E-05	-	4.56E-03	2.16E-05	-
Chromium	1.06E+00	1.88E+00	7.79E+00	2.53E+00	2.40E-01	5.07E+00	4.79E+00	8.80E-02	1.00E+01
HC-insoluble	2.68E-06	-	-	1.66E-01	-	-	1.94E-01	-	-
HC-soluble	1.27E-05	-	-	1.74E+00	-	-	1.99E+00	-	-
Mercury	6.99E-03	9.94E-06	4.18E+01	2.64E-01	1.97E-02	6.62E+02	3.53E-01	3.03E-03	4.54E+02
Lead	5.53E-01	5.33E-01	3.86E+00	3.70E+00	1.06E-01	5.38E+00	4.11E+00	2.81E-02	5.36E+00
Selenium	1.61E-02	2.90E-02	1.19E-01	4.48E-01	9.35E-03	5.78E-01	5.49E-01	1.30E-03	4.70E-01

[a] Mercury solids are assumed to be a metal amalgam.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.27 Contaminant Concentrations in Grout Solids by Disposal Site: CH Non-Alpha LLMW — Case 10a (NTS) and Case 17 (Hanford), Non-PCBs

Contaminant	Concentration in Grout Solids (unit as indicated)		
	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	4.22E+03	9.73E+02	2.07E+00
Radionuclide (Ci/m^3)			
H-3	4.52E−01	1.03E−02	8.38E−02
Fe-55	2.17E−02	1.83E−02	4.36E−02
Co-60	2.09E−01	1.46E−01	4.89E−01
Ni-59	8.47E−03	2.76E−03	2.47E−02
Ni-63	9.90E−01	3.48E−01	2.90E+00
Sr-90	3.14E−01	1.21E−01	5.80E−01
Y-90	3.14E−01	1.21E−01	5.80E−01
Nb-94	4.07E−04	1.32E−04	1.20E−03
Tc-99	2.34E−03	2.27E−03	9.62E−03
Sb-125	4.48E−05	3.86E−05	8.70E−05
Cs-137	3.51E−01	1.35E−01	6.47E−01
Ba-137m	3.50E−01	3.23E−02	6.17E−01
Pm-147	1.17E−03	1.00E−03	2.30E−03
Sm-151	5.11E−03	4.05E−04	8.68E−03
Eu-154	8.74E−04	1.83E−04	1.85E−03
Th-234[b]	1.49E−02	3.37E−03	4.97E−02
U-235	5.12E−06	1.16E−06	2.28E−05
U-238	1.49E−02	3.37E−03	4.97E−02
Pu-238	1.60E−02	1.33E−03	2.74E−02
Pu-239	2.10E−04	1.44E−05	3.36E−04
Pu-240	6.68E−04	6.89E−05	2.69E−03
Pu-241	6.21E−03	9.18E−04	1.33E−02
Am-241	4.20E−04	1.72E−05	4.34E−04
Chemical contaminant (kg/m^3)			
Cyanides	8.48E−07	2.78E−05	-
Methylene chloride	2.48E−03	6.06E−04	-
Silver	6.07E−02	6.05E−03	1.16E−01
Arsenic	2.00E−02	4.64E−03	4.12E−01
Barium	1.76E+00	1.16E−01	3.30E+00
Cadmium	3.74E−01	5.89E−02	1.47E+00
Cl-2-x[c]	1.99E−03	3.53E−04	-
Cl-3-x[c]	4.34E−02	1.46E−02	-
Cl-4-x[c]	4.90E−03	4.13E−03	-
Cl-F-x[d]	1.73E−03	6.84E−05	-
Chromium	2.23E+00	1.98E−01	4.87E+00
HC[e]-insoluble	1.67E−01	-	-
HC-soluble	1.74E+00	-	-
Mercury	2.23E−01	1.66E−02	5.83E+02
Lead	3.25E+00	8.92E−02	4.84E+00
Selenium	3.69E−01	7.62E−03	5.10E−01

[a] Mercury solids are assumed to be a metal amalgam.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.28 Contaminant Concentrations in Grout Solids by Disposal Site: CH Non-Alpha LLMW — Case 15, Non-PCBs

Contaminant	Concentration in Grout Solids (unit as indicated)								
	Hanford			INEL			LANL		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	1.26E+03	7.38E+01	4.90E-01	1.60E+02	1.16E+01	4.04E-02	3.01E-01	2.24E-01	4.27E-04
Radionuclide (Ci/m^3)									
H-3	1.31E+00	1.01E-01	2.07E-01	4.62E-01	1.11E-01	8.55E-02	-	-	-
Fe-55	1.18E-02	9.59E-04	2.34E-02	3.81E-01	1.50E+00	1.47E+00	1.42E-02	8.70E-03	9.72E-02
Co-60	9.16E-02	7.53E-03	1.81E-01	2.93E+00	1.15E+01	1.13E+01	1.13E-01	6.92E-02	7.73E-01
Ni-59	3.07E-03	3.87E-04	5.61E-03	4.05E-02	1.51E-01	1.50E-01	1.89E-03	1.15E-03	1.29E-02
Ni-63	3.52E-01	4.29E-02	6.51E-01	5.38E+00	2.02E+01	2.01E+01	2.51E-01	1.53E-01	1.71E+00
Sr-90	8.36E-01	8.38E-01	1.52E+00	2.14E-01	7.62E-01	6.93E-01	4.52E-03	1.70E-01	-
Y-90	8.36E-01	8.38E-01	1.52E+00	2.14E-01	7.62E-01	6.93E-01	4.52E-03	1.70E-01	-
Nb-94	1.40E-04	1.75E-05	2.56E-04	1.92E-03	7.16E-03	7.11E-03	-	-	-
Tc-99	4.17E-04	4.14E-04	7.58E-04	3.79E-04	1.41E-05	1.30E-04	3.72E-09	1.15E-05	-
Sb-125	2.50E-05	2.03E-06	4.95E-05	8.05E-04	3.18E-03	3.11E-03	-	-	-
Cs-137	9.38E-01	9.40E-01	1.71E+00	2.30E-01	8.09E-01	7.37E-01	4.81E-03	1.81E-01	-
Ba-137m	9.20E-01	1.42E-01	1.60E+00	2.21E-01	7.20E-01	7.43E-01	8.24E-02	5.03E-02	5.62E-01
Pm-147	6.44E-04	5.23E-05	1.28E-03	2.12E-02	8.25E-02	8.24E-02	7.90E-03	4.82E-03	5.39E-02
Sm-151	1.41E-02	2.18E-03	2.45E-02	2.11E-03	6.44E-03	6.72E-03	7.55E-04	4.61E-04	5.16E-03
Eu-154	1.54E-03	2.33E-04	2.69E-03	2.51E-03	9.22E-03	9.33E-03	9.44E-04	5.76E-04	6.44E-03
Th-234[b]	1.11E-03	2.98E-04	2.09E-03	1.17E-02	2.84E-02	2.92E-02	3.82E-06	7.54E-04	3.01E-05
U-235	-	-	-	8.70E-09	1.23E-09	1.99E-08	2.97E-09	5.87E-07	2.34E-08
U-238	1.11E-03	2.98E-04	2.09E-03	1.17E-02	2.84E-02	2.92E-02	3.82E-06	7.54E-04	3.01E-05
Pu-238	4.39E-02	6.77E-03	7.61E-02	7.62E-03	2.38E-02	2.48E-02	3.26E-03	1.99E-03	2.23E-02
Pu-239	5.92E-04	9.15E-05	1.03E-03	2.27E-05	8.02E-07	7.50E-06	-	-	-
Pu-240	3.38E-04	5.22E-05	5.85E-04	9.50E-05	8.37E-06	3.52E-04	-	-	-
Pu-241	1.02E-02	1.70E-03	1.78E-02	7.37E-03	2.04E-02	2.44E-02	1.65E-02	1.01E-02	1.12E-01
Am-241	1.20E-03	1.28E-04	1.44E-03	4.53E-05	8.02E-07	7.50E-06	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	7.66E-07	8.33E-05	-	4.25E-07	4.40E-05	-	3.02E-09	1.99E-09	-
Methylene chloride	1.83E-03	4.67E-03	-	6.13E-03	5.44E-04	-	3.43E-06	2.25E-06	-
Silver	4.60E-02	1.30E-02	9.18E-02	1.89E-02	1.73E-02	2.67E-02	1.07E-02	9.46E-03	7.29E-02
Arsenic	1.46E-02	1.10E-02	2.99E-01	7.64E-03	7.14E-03	1.08E-01	9.33E-03	6.40E-03	6.37E-02
Barium	1.24E+00	8.43E-02	2.43E+00	5.32E-01	6.58E-01	8.50E-01	6.99E-03	6.89E-02	4.81E-02
Cadmium	5.00E-02	5.86E-03	2.18E-01	8.67E-02	3.19E-02	4.28E-01	5.93E-02	3.88E-02	4.05E-01
Cl-2-x[c]	1.66E-03	2.46E-03	-	2.54E-03	3.59E-04	-	1.72E-05	1.06E-05	-
Cl-3-x[c]	4.93E-02	2.92E-02	-	3.57E-02	8.46E-03	-	2.16E-05	1.35E-05	-
Cl-4-x[c]	8.02E-03	1.89E-02	-	1.09E-02	2.41E-03	-	2.02E-05	1.33E-05	-
Cl-F-x[d]	1.07E-03	1.48E-04	-	2.62E-03	2.37E-04	-	1.72E-06	1.12E-06	-
Chromium	1.39E+00	9.92E-02	2.95E+00	6.37E-01	7.56E-01	9.92E-01	2.27E-01	2.53E-01	1.55E+00
HC[e]-insoluble	1.76E-01	-	-	8.62E-02	-	-	3.77E-06	-	-
HC-soluble	1.83E+00	-	-	8.89E-01	-	-	4.17E-08	-	-
Mercury	1.33E-01	3.59E-02	4.38E+02	6.05E-02	7.42E-03	1.67E+02	2.29E-04	3.07E-05	1.43E+00
Lead	2.34E+00	1.24E-01	3.50E+00	1.77E+00	2.00E-01	9.57E-01	4.33E-01	2.97E-01	2.96E+00
Selenium	2.16E-01	1.31E-02	3.67E-01	2.59E-02	1.02E-02	5.05E-02	3.34E-03	3.80E-03	2.28E-02

TABLE A.28 (Cont.)

Contaminant	Concentration in Grout Solids (unit as indicated)								
	NTS			ORR			SRS		
	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]	Cement Grout	Polymer Grout	Mercury Solids[a]
Volume (m^3/yr)	6.99E-03	4.92E-01	1.04E-05	2.70E+03	6.41E+02	1.38E+00	1.99E+02	2.46E+02	1.60E-01
Radionuclide (Ci/m^3)									
H-3	-	-	-	5.60E-03	1.02E-04	4.33E-04	1.07E+00	4.90E-03	4.26E-01
Fe-55	-	-	-	5.16E-03	3.32E-04	8.07E-03	2.08E-02	5.70E-04	5.17E-02
Co-60	1.16E-01	7.48E-04	7.53E-01	7.17E-02	8.71E-03	1.38E-01	6.37E-01	1.35E-02	1.74E+00
Ni-59	1.86E-02	1.21E-04	1.22E-01	5.72E-03	1.03E-03	1.31E-02	5.41E-02	1.05E-03	1.52E-01
Ni-63	1.96E+00	1.27E-02	1.28E+01	6.17E-01	1.09E-01	1.40E+00	6.55E+00	1.28E-01	1.84E+01
Sr-90	1.65E-02	6.56E-03	-	7.18E-02	6.97E-02	1.86E-01	3.84E-01	9.10E-03	1.08E+00
Y-90	1.65E-02	6.56E-03	-	7.18E-02	6.97E-02	1.86E-01	3.84E-01	9.10E-03	1.08E+00
Nb-94	8.79E-04	5.69E-06	5.73E-03	2.70E-04	4.85E-05	6.19E-04	2.73E-03	5.33E-05	7.67E-03
Tc-99	2.03E-04	2.67E-04	-	3.51E-03	3.39E-03	1.41E-02	1.58E-04	3.16E-06	4.45E-04
Sb-125	-	-	-	1.09E-05	7.04E-07	1.71E-05	2.04E-05	7.51E-07	4.25E-05
Cs-137	1.86E-02	7.42E-03	-	8.10E-02	7.88E-02	2.10E-01	4.12E-01	9.76E-03	1.16E+00
Ba-137m	3.10E-01	2.01E-03	2.02E+00	8.93E-02	1.67E-02	2.10E-01	3.92E-01	7.60E-03	1.10E+00
Pm-147	-	-	-	2.81E-04	1.81E-05	4.40E-04	5.24E-04	1.93E-05	1.09E-03
Sm-151	4.00E-03	2.59E-05	2.61E-02	1.14E-03	2.15E-04	2.69E-03	4.47E-03	8.64E-05	1.26E-02
Eu-154	1.23E-03	7.96E-06	8.02E-03	3.75E-04	6.77E-05	8.63E-04	2.11E-03	4.16E-05	5.92E-03
Th-234	4.84E-02	1.26E-02	3.21E-01	2.25E-02	4.54E-03	7.22E-02	2.08E-03	4.31E-05	5.73E-03
U-235	4.59E-06	9.60E-06	3.46E-05	8.19E-06	1.76E-06	3.41E-05	-	-	-
U-238	4.84E-02	1.26E-02	3.21E-01	2.25E-02	4.54E-03	7.22E-02	2.08E-03	4.31E-05	5.73E-03
Pu-238	1.31E-02	8.45E-05	8.52E-02	3.74E-03	7.03E-04	8.79E-03	1.41E-02	2.72E-04	3.95E-02
Pu-239	2.11E-04	1.36E-06	1.38E-03	5.90E-05	1.13E-05	1.40E-04	-	-	-
Pu-240	3.16E-04	2.05E-06	2.06E-03	8.84E-05	1.69E-05	2.09E-04	1.11E-02	2.12E-04	3.12E-02
Pu-241	1.38E-02	8.95E-05	9.02E-02	3.93E-03	7.43E-04	9.25E-03	2.11E-02	2.17E-04	3.15E-02
Am-241	2.11E-04	1.36E-06	1.38E-03	1.12E-04	1.13E-05	1.40E-04	-	-	-
Chemical contaminant (kg/m^3)									
Cyanides	3.15E-09	2.43E-09	-	9.62E-07	3.16E-05	-	1.54E-07	7.44E-07	-
Methylene chloride	3.55E-06	2.47E-06	-	2.12E-03	2.43E-04	-	8.38E-03	3.36E-04	-
Silver	3.04E-02	4.83E-02	2.22E-01	7.01E-02	7.23E-03	1.30E-01	5.90E-02	2.83E-04	9.85E-02
Arsenic	1.20E-02	1.16E-02	8.37E-02	2.28E-02	5.23E-03	4.18E-01	2.76E-02	1.07E-03	7.88E-01
Barium	5.12E-01	1.06E+00	3.85E+00	2.06E+00	1.50E-01	3.70E+00	1.92E+00	8.11E-03	3.08E+00
Cadmium	6.15E-02	4.32E-02	4.22E-01	3.36E-01	5.32E-02	1.17E+00	3.15E+00	9.10E-02	8.22E+00
Cl-2-x	1.30E-05	2.54E-06	-	1.97E-03	1.76E-04	-	3.87E-03	1.80E-04	-
Cl-3-x	1.74E-05	5.26E-06	-	4.04E-02	1.16E-02	-	5.45E-02	1.86E-02	-
Cl-4-x	2.11E-05	1.48E-05	-	2.90E-03	2.48E-03	-	7.66E-03	4.11E-03	-
Cl-F-x	1.77E-06	1.24E-06	-	1.78E-03	7.43E-05	-	4.56E-03	2.16E-05	-
Chromium	1.06E+00	1.88E+00	7.79E+00	2.53E+00	2.40E-01	5.07E+00	4.79E+00	8.80E-02	1.00E+01
HC-insoluble	2.68E-06	-	-	1.66E-01	-	-	1.94E-01	-	-
HC-soluble	1.27E-05	-	-	1.74E+00	-	-	1.99E+00	-	-
Mercury	6.99E-03	9.94E-06	4.18E+01	2.64E-01	1.97E-02	6.62E+02	3.53E-01	3.03E-03	4.54E+02
Lead	5.53E-01	5.33E-01	3.86E+00	3.70E+00	1.06E-01	5.38E+00	4.11E+00	2.81E-02	5.36E+00
Selenium	1.61E-02	2.90E-02	1.19E-01	4.48E-01	9.35E-03	5.78E-01	5.49E-01	1.30E-03	4.70E-01

[a] Mercury solids are assumed to be a metal amalgam.

[b] Th-234 is in equilibrium with Pa-234m.

[c] Chlorinated solvents (number indicates chlorine content).

[d] Chlorofluorocarbon solvents (Freons).

[e] Hydrocarbons.

TABLE A.29 CH Non-Alpha Waste Volume Reduction by Handling and Treatability: Regionalized Alternative — 4 Sites Treat and 6 Sites Dispose

WM PEIS Code	Name of Waste	Gross Input Volume (m^3/yr)	Volume of Disposed Waste per Unit Volume of Input Waste	Percent of Treated Waste		
				Cement Grout	Polymer Grout	Mercury Solids[a]
1	Wastewaters	256.9	0.199	2.60	97.40	0.000
2	Aqueous slurries	68.8	0.291	78.76	21.19	0.047
3	Aqueous halogenated organic liquids	340.1	0.539	17.46	82.53	0.004
4	Aqueous nonhalogenated organic liquids	400.4	0.138	79.32	20.66	0.019
5	Pure halogenated organic liquids	649.5	1.022	11.72	88.26	0.024
6	Pure nonhalogenated organic liquids	583.8	0.112	99.82	0.15	0.022
7	Solid process residues	555.5	0.645	98.23	1.75	0.025
8	Inorganic sludges	3,174.3	0.453	97.17	2.77	0.062
9	Salt wastes	26.1	0.553	0.00	100.00	0.000
10	Solidifies inorganic process residues	21.0	0.704	99.91	0.072	0.016
11	Nonhalogenated organic particulates and sludges	111.3	0.064	71.97	27.68	0.350
12	Halogenated organic particulates and sludges	53.6	0.327	14.77	85.20	0.030
13,14	Solid organic chemicals	8.6	0.215	14.78	85.21	0.000
15	Contaminated soils without debris	1,011.0	0.232	99.12	0.88	0.002
16	Contaminated soils with debris	1,243.8	0.465	96.36	3.58	0.057
17	Metal debris	160.0	0.123	99.72	0.28	0.000
18	Inorganic nonmetal debris	100.7	0.383	99.67	0.33	0.000
19	Combustible debris	384.7	0.262	87.71	12.10	0.183
20	Heterogeneous debris	3,620.0	0.186	95.93	4.03	0.038
21	Organic lab packs and scintillation cocktails	373.6	0.258	86.17	13.82	0.001
22	Aqueous lab packs	190.7	0.254	97.55	2.45	0.000
23	Solid lab packs	150.6	0.279	77.64	22.28	0.082

[a] Mercury solids are assumed to a metal amalgam.