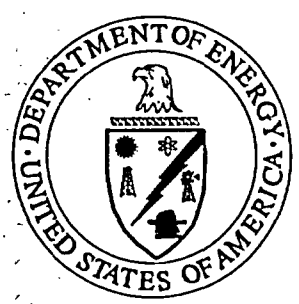
The Current and Planned Low-Level Waste Disposal Capacity Report Revision 2

December 2000



U.S. Department of Energy
Office of Environmental Management

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

List of Tables

List of Figures

List of Acronyms and Abbreviations

AEC	Atomic Energy Commission
am	activated metal
CA	composite analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ci	curie
cm	centimeter
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
EMWMF	Environmental Management Waste Management Facility
ERDF	Environmental Restoration Disposal Facility (Hanford)
FY	fiscal year
ha	hectare
ICDF	Idaho CERCLA Disposal Facility
ILAW	Immobilized Low Activity Waste (Hanford)
ILNT	Intermediate Level Non-Tritiated (SRS)
ILT	Intermediate Level Tritiated (SRS)
ILW	Intermediate Level Waste (SRS)
INEEL	Idaho National Engineering and Environmental Laboratory
IPABS	Integrated Planning, Accountability, and Budgeting System
IWMF	Interim Waste Management Facility
km	kilometer
LANL	Los Alamos National Laboratory
LAW	Low Activity Waste (SRS)
LFRG	Low-Level Waste Disposal Facility Federal Review Group
LLW	low-level waste
m	metastable
m^3	cubic meters
mi	mile
mR/hr	millirem per hour
MLLW	mixed low-level waste
NTS	Nevada Test Site
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSDF	On-Site Disposal Facility (Fernald)
PA	performance assessment
PE	Performance Evaluation
RCRA	Resource Conservation and Recovery Act
ROD	record of decision
RWMC	Radioactive Waste Management Complex (INEEL)
RWMS	Radioactive Waste Management Site (NTS)
SDD	Stream Disposition Data (part of IPABS)
SOF	sum-of-fractions
SRS	Savannah River Site
TA-54	Technical Area 54 (LANL)
WAC	waste acceptance criteria

Table 2-2. Projected LLW Disposal Volumes by Generator Site (2000-2070, cubic meters) [a]

Generator Site	Envir. Restoration [b]	Other Activities [b]	Total	Projected Disposal	
				Disposal Facility [c,d]	Facility Type [e]
Ames Laboratory		120	120	Hanford 200 Area Burial Grounds (130,000 m³)	Waste Operations Disposal Facilities (1,200,000 m³)
Argonne National Laboratory - East	1,600	11,000	13,000		
Bettis Atomic Power Lab		1,500	1,500		
Brookhaven National Laboratory	2,200	6,800	9,000		
Columbus Environmental Management Project - West Jefferson	2,800		2,800		
Energy Technology Engineering Center	1,500		1,500		
Fermi National Accelerator Laboratory		1,800	1,800		
Hanford Site	340	91,000	92,000		
Knolls Atomic Power Lab-Schenectady		690	690		
Laboratory for Energy-Related Health Research		11	11		
Lawrence Berkeley National Laboratory		270	270		
Massachusetts Institute of Technology [g]		11	11		
Paducah Gaseous Diffusion Plant		320	320		
Parks Township [g]		2,800	2,800		
Portsmouth Gaseous Diffusion Plant		290	290		
Princeton Plasma Physics Laboratory		2,300	2,300		
Stanford Linear Accelerator Center		790	790		
Idaho National Engineering and Environmental Laboratory [f]	10,000	9,800	20,000	INEEL RWMC (20,000 m³)	
Los Alamos National Laboratory	34,000	88,000	120,000	LANL TA-54 Area G (120,000 m³)	
Ashtabula Environmental Management Project	40	380	420	NTS Areas 3 & 5 RWMS (780,000 m³)	
Energy Technology Engineering Center	270		270		
Fernald Environmental Management Project	64,000		64,000		
Inhalation Toxicology Research Institute		2,200	2,200		
Kansas City Plant		24	24		
Lawrence Livermore National Laboratory - Main Site		14,000	14,000		
Miamisburg Environmental Management Project	18,000		18,000		
Nevada Test Site	120,000	560	120,000		
Oak Ridge Reservation	360	400,000	400,000		
Pantex Plant	190	54	250		
Rocky Flats Environmental Technology Site	150,000	11,000	160,000		
Sandia National Laboratory - New Mexico	600	2,700	3,300		
Oak Ridge Reservation		1,800	1,800	ORR IWMF (1,800 m³)	
Savannah River Site		38,000	38,000	SRS LAW Vaults (38,000 m³)	
Savannah River Site		5,100	5,100	SRS ILW Vaults (5,100 m³)	
Savannah River Site		63,000	63,000	SRS E-Area Trenches (63,000 m³)	
Fernald Environmental Management Project [g]	1,600,000		1,600,000	Fernald OSDF (1,600,000 m³)	Existing/Approved Environmental Restoration CERCLA Facilities (7,500,000 m³)
Hanford Site	5,000,000		5,000,000	Hanford ERDF (5,000,000 m³)	
Oak Ridge Reservation	890,000		890,000	ORR EMWMF (890,000 m³)	
Idaho National Engineering and Environmental Laboratory	76,000		76,000	INEEL ICDF (76,000 m³)	Planned Environmental Restoration CERCLA Facilities (170,000 m³)
Idaho National Engineering and Environmental Laboratory	90,000		90,000	INEEL Remediation Unit (90,000 m³)	

Table 2-2. Projected LLW Disposal Volumes by Generator Site (2000-2070, cubic meters) [a] (Continued)

Generator Site	Envir. Restoration [b]	Other Activities [b]	Total [c]	Projected Disposal	
				Disposal Facility [d]	Facility Type [e]
Brookhaven National Laboratory	8,000		8,000	To Be Determined (280,000 m³)	
General Electric Vallecitos Nuclear Center	20		20		
Idaho National Engineering and Environmental Laboratory	760	69,000	70,000		
Laboratory for Energy-Related Health Research	5		5		
Los Alamos National Laboratory		27	27		
Oak Ridge Reservation	26,000	20	26,000		
Portsmouth Gaseous Diffusion Plant		6,900	6,900		
Princeton Plasma Physics Laboratory		700	700		
Savannah River Site	6,100		6,100		
Separations Process Research Unit	8,200		8,200		
West Valley Demonstration Project		150,000	150,000		
Ames Laboratory		100	100	Commercial Disposal (1,000,000 m³)	
Argonne National Laboratory - East		5,000	5,000		
Ashtabula Environmental Management Project	5,500		5,500		
Brookhaven National Laboratory	39,000	4,500	43,000		
Columbus Environmental Management Project - West Jefferson	9,500		9,500		
Energy Technology Engineering Center	15,000		15,000		
Fernald Environmental Management Project	500,000		500,000		
Grand Junction Office	70		70		
Laboratory for Energy-Related Health Research	3,200	140	3,400		
Lawrence Berkeley National Laboratory	220	2,200	2,400		
Lawrence Livermore National Laboratory - Main Site		160	160		
Miamisburg Environmental Management Project	72,000		72,000		
Oak Ridge Reservation	110,000	75,000	190,000		
Paducah Gaseous Diffusion Plant	100,000	6,500	110,000		
Portsmouth Gaseous Diffusion Plant	110	11,000	11,000		
Princeton Plasma Physics Laboratory		51	51		
Rocky Flats Environmental Technology Site		110	110		
Sandia National Laboratory - New Mexico	1,500		1,500		
Savannah River Site	30,000	14,000	43,000		
West Valley Demonstration Project		5,700	5,700		
Totals [f]	**9,000,000**	**1,100,000**	**10,100,000**		

[a] Volume projections and disposal facility designations are based on the June 26, 2000, *Integrated Planning, Accountability, and Budgeting System Stream Disposition Data* (IPABS SDD). Some projections do not represent final decisions and will require further assessment under the National Environmental Policy Act. These data and the subsequent volumetric analysis do not include LLW resulting from treatment of high-level waste, which is discussed in Section 2.8.1, other excluded waste and materials discussed in Section 2.8, and disposition projections not documented in the June 26, 2000, IPABS SDD. It is expected that the responsible DOE sites will document these disposition projections in future versions of the IPABS SDD.

[b] Volumes have been rounded to two significant figures. The volumes of waste attributed to environmental restoration in this table differ from the corresponding volumes identified in DOE's Central Internet Database, which served as the primary data source for this analysis. The volumes cited here reflect an analysis of how the "parent" waste streams were originally generated prior to treatment, off-site shipment, or co-mingling with other waste streams.

[c] Because of rounding, some totals may not equal the sum of their components.

[d] See Table 1-1 for full facility names. Facility names have been shortened in this table to improve data presentation.

[e] Massachusetts Institute of Technology and Parks Township are not DOE sites.

[f] INEEL RWMC disposal volumes include LLW from the Argonne National Laboratory - West, which is contiguous to INEEL.

[g] For the Fernald OSDF, the 2000-2070 projected volume of 1.6 million m³ differs from the 1.9 million m³ volume reported in the CID. The 1.6 million m³ volume reflects the projected compacted waste volume in the OSDF, while the 1.9 million m³ volume reflects the uncompacted volume prior to disposal.

Table 2-3. Projected MLLW Disposal Volumes by Generator Site (2000-2070, cubic meters) [a]

Generator Site	Envir. Restoration [b]	Other Activities [b]	Total [c]	Projected Disposal	
				Disposal Facility [c]	Facility Type [c]
Hanford Site	340	62,000	63,000	Hanford Site Mixed Waste Trenches 31 & 34 (63,000 m³)	Waste Operations Disposal Facilities (63,000 m³)
Nevada Test Site		0.3	0.3	NTS Area 5 Mixed Waste Disposal Unit (0.3 m³)	
Fernald Environmental Management Project	90		90	Fernald OSDF (90 m³)	Existing/Approved Environmental Restoration CERCLA Facilities (200,000 m³)
Oak Ridge Reservation	200,000		200,000	ORR EMWMF (200,000 m³)	
Idaho National Engineering and Environmental Laboratory	37,000		37,000	INEEL ICDF (37,000 m³)	Planned Environmental Restoration CERCLA Facilities (37,000 m³)
Columbus Environmental Management Project - West Jefferson	3		3	To Be Determined (5,100 m³)	
Energy Technology Engineering Center	2		2		
Fernald Environmental Management Project	20		20		
Grand Junction Office	<1		<1		
Hanford Site		1	1		
Idaho National Engineering and Environmental Laboratory		3	3		
Laboratory for Energy-Related Health Research	<1		<1		
Lawrence Berkeley National Laboratory		<1	<1		
Los Alamos National Engineering Laboratory		8	8		
Nevada Test Site		<1	<1		
Oak Ridge Reservation	94		94		
Portsmouth Gaseous Diffusion Plant		1,200	1,200		
Sandia National Laboratory - New Mexico		19	19		
Savannah River Site		3,700	3,700		
Separations Process Research Unit	70		70		

Table 2-3. Projected MLLW Disposal Volumes by Generator Site (2000-2070, cubic meters) [a] (Continued)

Generator Site	Envir. Restoration [b]	Other Activities [b]	Total [c]	Projected Disposal	
				Disposal Facility [a]	Facility Type [a]
Ames Laboratory		1	1	Commercial Disposal (150,000 m³)	
Argonne National Laboratory - East	180	390	560		
Argonne National Laboratory - West		3	3		
Ashtabula Environmental Management Project	50		50		
Brookhaven National Laboratory	120	340	460		
Columbus Environmental Management Project - West Jefferson	11		11		
Energy Technology Engineering Center	1,400		1,400		
Fernald Environmental Management Project	4,700		4,700		
General Atomics		1	1		
Grand Junction Office	2		2		
Idaho National Engineering and Environmental Laboratory	20	2,400	2,400		
Inhalation Toxicology Research Institute		71	71		
Laboratory for Energy-Related Health Research		1	1		
Lawrence Berkeley National Laboratory		110	110		
Lawrence Livermore National Laboratory - Main Site		140	140		
Los Alamos National Engineering Laboratory	2,400	2,500	4,800		
Miamisburg Environmental Management Project		<1	<1		
Oak Ridge Reservation	940	52,000	53,000		
Paducah Gaseous Diffusion Plant	23,000	5,100	28,000		
Portsmouth Gaseous Diffusion Plant	970	9,100	10,000		
Rocky Flats Environmental Technology Site	35,000	3,800	39,000		
Sandia National Laboratory - New Mexico	3,300	930	4,200		
Totals [c]	**310,000**	**140,000**	**450,000**		

[a] See Table 1-1 for full facility names. Facility names have been shortened in this table to improve data presentation. Volume projections and disposal facility designations are based on the June 26, 2000 *Integrated Planning, Accountability, and Budgeting System Stream Disposition Data* (IPABS SDD). Some projections do not represent final decisions and will require further assessment under the National Environmental Policy Act. These data and the subsequent volumetric analysis do not include waste and materials discussed in Section 2.8 and disposition projections not documented in the June 26, 2000, IPABS SDD. It is expected that the responsible DOE sites will document these disposition projections in future versions of the IPABS SDD.

[b] The volumes of waste attributed to environmental restoration in this table differ from the corresponding volumes identified in DOE's Central Internet Database, which served as the primary data source for this analysis. The volumes cited here reflect an analysis of how the "parent" waste streams were originally generated prior to treatment, off-site shipment, or co-mingling with other waste streams.

[c] Because of rounding, some totals may not equal the sum of their components.

2.2.2 Environmental Restoration Generation Projections

DOE environmental restoration activities generate larger volumes of LLW and MLLW than any other DOE activities. Waste-generating environmental restoration activities include assessment, remediation, and facility decommissioning. Across the complex, environmental restoration activities are projected to generate a total of 35 million m^3 of LLW media and 2.5 million m^3 of MLLW media, excluding large volume wastewater, groundwater, and surface water media. Estimates of media volumes refer to "in-place" volumes of contaminated soil, previously disposed materials, buildings, and other in-place materials. These in-place volumes reflect DOE's current understanding of contaminated media and facilities, and these volumes may increase or decrease in the future as site characterization activities continue. At each site, the volume of LLW or MLLW, if any, that will be generated and eventually disposed will depend on the specific response strategies and methodologies used. These response strategies and methodologies will be developed by the Department through discussions with Federal and State regulators. The general response strategies used by the Department range from "no further action" to removal of all contaminated media for disposal in an engineered facility.

Tables 2-4 and 2-5 present the estimated media volumes expected to be managed in place (in-situ) and waste volumes expected to be generated by environmental restoration activities at each site (excluding large volume wastewater, groundwater, and surface water media). For the environmental restoration waste generated at each site, Tables 2-4 and 2-5 each show five different disposition pathways, including DOE treatment or processing prior to disposal, direct disposal in DOE CERCLA facilities, direct disposal in DOE waste operations facilities, transfer to commercial facilities, or *to be determined.*

The volumes of material presented in Tables 2-4 and 2-5 are related to, but often different from, those shown in Tables 2-2 and 2-3. Tables 2-2 and 2-3 reflect final disposition volumes for newly generated and existing inventories of waste, and Tables 2-4 and 2-5 reflect initial disposition strategies of newly generated environmental restoration waste. These quantities can differ whenever the waste undergoes processing or treatment or there is already an existing inventory of waste. For environmental restoration wastes that are treated prior to disposal, Tables 2-2 and 2-3 include post-treatment volumes going to disposal, while Tables 2-4 and 2-5 include pre-treatment volumes. For some generators, waste volumes in Tables 2-2 and 2-3 are the same as those in Tables 2-4 and 2-5 because the waste goes directly from initial generation to final disposition without treatment and there are no existing inventories. For other generators, the volumes in the tables differ for the reasons outlined above.

Of the 35 million m^3 of LLW media shown in Table 2-4, 9.0 million m^3 of LLW is projected to be generated through ex-situ response strategies. Similarly, of the 2.5 million m^3 of MLLW media shown in Table 2-5, 280,000 m^3 of MLLW is projected to be generated through ex-situ response strategies.

Table 2-4. LLW Media from Environmental Restoration Activities (cubic meters) [a]

Site	Solid LLW Media Volume Managed In-Situ	Volume of Solid LLW Generated from Environmental Responses (2000-2070)						Totals [d]
		Treatment or Processing in DOE Facilities	Disposal in DOE CERCLA Cells	Disposal in DOE Waste Operations Facilities	Transfer to Commercial Facilities [b]	Disposition to be Determined [c]	Total Ex-Situ Volume Generated	
Argonne National Laboratory - East				1,200			1,200	1,200
Argonne National Laboratory - West	14,000	3		110			110	14,000
Ashtabula Environmental Management Project		23,000		420	200		24,000	24,000
Brookhaven National Laboratory				1,100	36,000		37,000	37,000
Columbus Environmental Management Project				1,000	11,000		12,000	12,000
Energy Technology Engineering Center				2,300	13,000		15,000	15,000
Fernald Environmental Management Project		450,000	1,800,000	20,000	43,000		2,400,000	2,400,000
General Electric Vallecitos Nuclear Center						20	20	20
Grand Junction Office					5		5	5
Hanford Site	20,000,000		5,000,000				5,000,000	25,000,000
Idaho National Engineering and Environmental Laboratory	400,000	53,000	76,000	3		10	130,000	530,000
Laboratory for Energy-Related Health Research		1,900					1,900	1,900
Lawrence Berkeley National Laboratory					220		220	220
Los Alamos National Laboratory	290,000			34,000			34,000	330,000
Miamisburg Environmental Management Project				18,000	72,000		90,000	90,000
Nevada Test Site	2,100,000	110,000		8,500			120,000	2,200,000
Oak Ridge Reservation	1,600,000	190,000	700,000	460	110,000	40,000	1,000,000	2,700,000
Paducah Gaseous Diffusion Plant					5,700		5,700	5,700
Pantex Plant				1			1	1
Portsmouth Gaseous Diffusion Plant					110		110	110
Sandia National Laboratories - New Mexico				330	1,500		1,800	1,800
Savannah River Site	1,400,000				52,000		52,000	1,400,000
Separations Process Research Unit						7,800	7,800	7,800
Totals [d]	**26,000,000**	**830,000**	**7,700,000**	**88,000**	**350,000**	**48,000**	**9,000,000**	**35,000,000**

[a] Data compiled from DOE IPABS/SDD June 26, 2000, data set. Volumes exclude large-volume liquids categorized as wastewater, groundwater, or surface water. Volumes shown as being disposed in DOE CERCLA and DOE waste operations facilities are a subset of the corresponding environmental restoration LLW volumes shown in Table 2-2. When comparing these categories, volume differences occur where either there is already an existing inventory of LLW or some LLW is to be processed in DOE facilities prior to disposal (third column from left in this table). The processing can change the waste volume.

[b] Transfer to Commercial Facilities category includes commercial treatment, disposal, and recycle.

[c] To Be Determined category includes volumes for which the management location (i.e., DOE or commercial) is not yet determined.

[d] Because of rounding, some totals may not equal the sum of their components.

Table 2-5. MLLW Media from Environmental Restoration Activities (cubic meters) [a]

Site	Solid MLLW Media Volume Managed In-Situ	Volume of MLLW Generated from Environmental Responses (2000-2070)						Totals
		Treatment or Processing in DOE Facilities	Disposal in DOE CERCLA Cells	Disposal in DOE Waste Operations Facilities	Transfer to Commercial Facilities [b]	Disposition to be Determined [c]	Total Ex-Situ Volume Generated	
Argonne National Laboratory - East					160	11	170	170
Argonne National Laboratory - West	150							150
Ashtabula Environmental Management Project		1,600			50		1,600	1,600
Brookhaven National Laboratory					110		110	110
Columbus Environmental Management Project		5			11		16	16
Energy Technology Engineering Center					1,300		1,300	1,300
Fernald Environmental Management Project		25			7,800			7,900
Grand Junction Office					<1	<1	<1	<1
Hanford Site		51	260				310	310
Idaho National Engineering and Environmental Laboratory	730,000	120	37,000			77	37,000	770,000
Los Alamos National Laboratory	30,000				2,400		2,400	32,000
Nevada Test Site	13,000	50					50	14,000
Oak Ridge Reservation	1,400,000	110,000	86,000		110	250	200,000	1,600,000
Paducah Gaseous Diffusion Plant	3,000				23,000		23,000	26,000
Portsmouth Gaseous Diffusion Plant	27				970		970	1,000
Sandia National Laboratories - NM	2,800				3,300		3,300	6,100
Savannah River Site	25,000							25,000
Separations Process Research Unit						50	50	50
Totals [d]	2,200,000	110,000	120,000		39,000	410	280,000	2,500,000

[a] Data compiled from DOE IPABS/SDD June 26, 2000, data set. Volumes exclude large-volume liquids categorized as wastewater, groundwater, and surface water. Volumes shown here as being disposed in DOE CERCLA and DOE waste operations facilities are a subset of the corresponding environmental restoration MLLW volumes shown in Table 2-3. When comparing these categories, volume differences occur where either there is already an existing inventory of waste or some waste is to be processed in DOE facilities prior to disposal (third column from left in this table). The processing can change both the waste volume and the waste type.

[b] Transfer to Commercial Facilities category includes commercial treatment, disposal, and recycle.

[c] To Be Determined category includes volumes for which the management location (i.e., DOE or commercial) is not yet determined.

[d] Because of rounding, some totals may not equal the sum of their components.

A.5 Oak Ridge Reservation

A.5.1 Background

Location: Oak Ridge Reservation (ORR) is located in a valley between the Cumberland and southern Appalachian mountain ranges in eastern Tennessee about 25 km west of Knoxville. ORR covers an area of 35,252 acres and contains three major facilities: Oak Ridge National Laboratory (ORNL), the Oak Ridge East Tennessee Technology Park (formerly called the "K-25" site), and the Oak Ridge Y-12 Plant.

Historical Activities: ORR was originally constructed as a research and development facility to support plutonium production and research. Today, ORR conducts research on the fission nuclear fuel cycle and nuclear fusion. ORNL is the only facility of the three at ORR that currently operates a disposal site for LLW: the Interim Waste Management Facility (IWMF) at Solid Waste Storage Area (SWSA) 6.

A.5.2 IWMF

A.5.2.1 Facility Description

Status: Located about 40 km west of Knoxville, in Melton Valley (MV) in the southwest region of ORR, the 28-ha (68-acre) SWSA 6 has been used by the ORNL since 1969 for the disposal of on-site generated LLW. Until 1986, all LLW generated at ORNL (including MLLW) was disposed of by shallow land burial, generally in unlined trenches and auger holes. This practice came under closer scrutiny by federal and state regulators and DOE officials, and as a result, in 1986 major changes in the operation of SWSA 6 were initiated. Because of the disposal practices conducted before 1986, some areas in SWSA 6 were remediated under a Resource Conservation and Recovery Act interim status closure agreement with the Tennessee Department of Environment and Conservation. The remediation activities were coordinated with ongoing Greater Confinement Disposal units waste operations. Remediation of SWSA 6 and all of MV will occur under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A Record of Decision (ROD) for MV is expected to be signed by the end of Fiscal Year 2000.

Waste Materials: SWSA 6 does not accept any mixed waste for disposal. On-site generated MLLW will be treated on site and sent for permanent disposal either to Hanford or NTS. The radioactive solid waste disposal facility, the IWMF, was constructed in 1991 for solid LLW disposal. While SWSA 6 also served as a disposal site for fission-product LLW in Greater Confinement Disposal units and for waste in shallow land burial units, the IWMF is the only currently active disposal unit at SWSA 6. In 1999, the IWMF was filled to 80% capacity.

General Design Features: Below-grade disposal methods used at SWSA 6 include concrete silos, wells in concrete silos, pipe-lined auger hole wells, unlined trenches, and landfills. ORNL began phasing out below-grade disposal operations in December 1992 at a Tennessee Department of Environment and Conservation request. Below-ground disposal operations ceased January 1, 1994. The wells in concrete silos and the pipe-lined auger hole wells in SWSA 5N are still used for retrievable storage of very high-range, remote-handled LLW.

The IWMF is the only active above-grade tumulus disposal facility in SWSA 6, occupying an area of approximately 3.8 ha (9.5 acres) in the southwest portion of SWSA 6. The IWMF began operation in December 1991 and provides for disposal of solid LLW. The original facility was designed for six tumulus pads. Each tumulus pad is approximately 18.2 m x 27.4 m (60 ft x 90 ft) and 38.1 cm (15 in) thick, constructed using high-density concrete and reinforced with epoxy-coated steel. The pad has concrete curbs 0.30 m (1 ft) high on the north, south, and west sides. The east side is used for vehicle access. Each pad provides disposal for approximately 330 vaults, approximately 897 m^3 (31,680 ft^3) stacked three high.

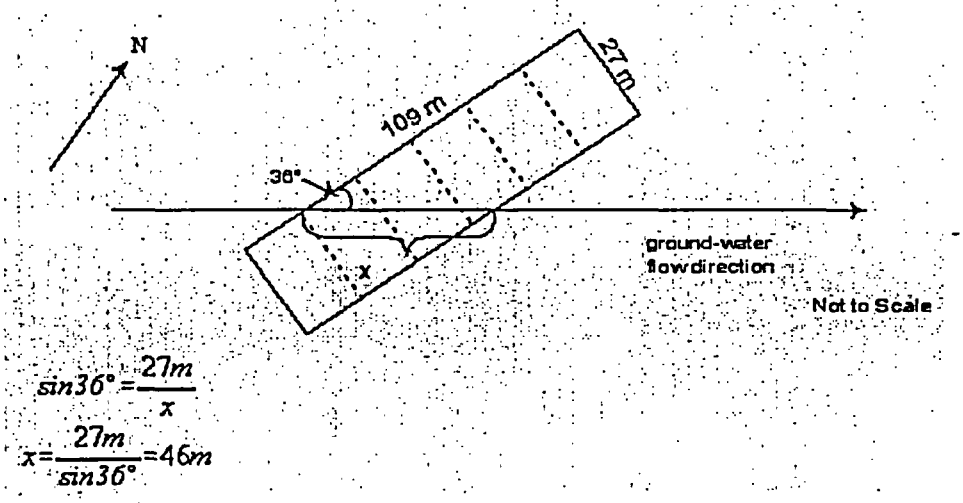
The IWMF is designed to divert water into three sumps, located in a monitoring station adjacent to the tumulus pads. The monitoring station is equipped for receiving, monitoring, and collecting sample from flows received from storm water, underpad, and infiltration drain systems. The underpad sump allows monitoring of any ground water that may accumulate under the pads. The storm water sump collects water from the pad in operation. The infiltration sump collects water from the pads filled with vaults. A principal feature of tumulus disposal is the inherent capability for monitoring ground water and surface water for contamination. The sealed concrete pad is the primary barrier from ground water. The pad is sloped 1 percent to one side where a curb and gutter collect all surface pad runoff and drain the water to a monitoring station. A liner below the pad provides a secondary barrier from the ground water and collects any water that may have penetrated the pad, which is then also diverted to the monitoring station.

A.5.2.2 Scaling Factor

Assumptions for determining scaling factor:

- IWMF is the only active disposal facility (U.S. DOE, 1997, pages 3-45 to 3-68).
- Ground-water flow is roughly west to east.
- IWMF consists of Pads 1 through 6, each 27 m by 18.2 m (U.S. DOE, 1997, p. 3-65).
- Orientation of the IWMF with ground-water flow as shown (U.S. DOE, 1997, p. E-28).
- Use PE tumulus values.

Figure A-5. ORR Facility Analysis Configuration



$$\sin 36° = \frac{27m}{x}$$

$$x = \frac{27m}{\sin 36°} = 46m$$

- Effective length parallel to the ground-water flow = 46 m
- SF = 50 m/46 m = 1.087

Stream Name:	3540: Treated BFV Burn Soil	3691: LLW from RMI (Aantabuta EMP)	3692: LLW from ORR	4136: U2bu Lead Contaminated Soil	4283: Treated Bulk Lead	4284: Treated EMAD Filters	4285: Treated TTF Solvents	4286: Treated A-12 Liquid	4287: Treated Sealed Sources
Gen Site:	Waste Control Spec	Aantabuta	Oak Ridge	Nevada Test Site	Waste Control Spec	Waste Control Spec	Waste Control Spec	Waste Control Spec	Waste Control Spec
FY99-70 M3	3	621	403.076	20	0	12	0	0	0
Profile Source:	Reported after 6/26/00 SDD	No Available Data	NTS Generator Data	Reported after 6/26/00 SDD	Rev.1 p. D1-NV-3 MLLW-12	Reported after 6/26/00 SDD	Reported after 6/26/00 SDD	Reported after 6/26/00 SDD	Reported after 6/26/00 SDD
H-3			2.39E+01			3.41E-08			
C-14			2.87E-04						4.81E-05
C-14am									
Al-26									
Cl-36			8.79E-04						
K-40			1.25E-05			1.47E-09			
Co-60			2.11E-01	3.51E-06		7.51E-05			
Ni-59			9.29E-07						
Ni-63			3.79E+00						
Ni-63am									
Se-79									
Sr-90			1.51E-02	6.35E-07		7.00E-08	4.17E-08		
Zr-93									
Nb-93m									
Nb-94									
Tc-99			1.68E-06						
Cd-113m									
Sn-121m									
Sn-126									
I-129			6.45E-08						
Cs-135									
Cs-137			1.44E+00	8.78E-07	5.80E-06	3.89E-07	4.17E-08		
Ba-133			4.54E-04						7.00E-04
Sm-151			4.36E-09						
Eu-152			1.15E-01						
Eu-154			3.60E-03						
Ra-226			1.48E-04	2.26E-06		3.62E-07			
Ra-228			1.01E-05						
Th-229			5.07E-07						
Th-230			2.56E-06				2.06E-07		
Th-232			1.10E-05	2.89E-06					
Pa-231			2.31E-07						
U-232			1.06E-07						
U-233			1.17E-05						
U-234			1.04E-03			4.05E-06			
U-235			4.72E-05			1.76E-07	6.83E-08		
U-236			8.99E-06						
U-238			5.11E-04			1.54E-07			
Np-237			1.16E-05				1.64E-08		
Pu-238			1.23E-05			6.35E-06	6.79E-08	4.43E-11	
Pu-239	2.24E-07		1.10E-05	1.30E-06		6.81E-08	3.85E-08	6.04E-10	
Pu-240	2.24E-07		6.59E-05						
Pu-241	2.24E-07		6.30E-09						
Pu-242			1.67E-08						
Pu-244									
Am-241	2.24E-07		3.09E-05	1.50E-06				4.08E-07	6.41E-07
Am-243			4.44E-05						
Cm-243									
Cm-244			1.89E-02						

LLW Alternative

Rep Site Name:	Los Alamos	Los Alamos	LEHR	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge
Stream Name:	3895: LLW - Accepted for Storage, from Licensed Activities (Greater than Class C)	3907: LLW - Accepted for Storage (Greater than Class C)	2859: Cobalt 60 source--ready for disposal	4340: RH LLW-4 (Beryllium Reflectors)	4402: DRS - K1420 Scrap Metal (L-020)	4403: DRS - K1420 Construction Debris	4404: DRS - K1420 Asbestos	4407: BNFL - K29/31/33 Classified	5022: LLW/Debris/Other Solids
Source Site:	TBD - Off-Site	TBD - Off-Site	LEHR	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge	Oak Ridge
FY00+ Disp:	14	13	5	20	44	29	2	22,897	18
Profile Source:	No Available Data	No Available Data	Reported in 6/26/00 SDD	Rev.1 p. D1-OR-2	Rev.1 p. D2-OR-3	Rev.1 p. D2-OR-3	Rev.1 p. D2-OR-2	Rev.1 p. D2-OR-2	Rev.1 p. D2-OR-3
H-3				2.40E+01					
C-14				2.93E-04					
C-14am									
Al-26									
Cl-36				6.81E-04					
K-40				1.26E-05					
Co-60			1.12E+02	2.12E-01					
Ni-59				9.32E-07					
Ni-63				3.80E+00					
Ni-63am									
Se-79									
Sr-90				1.51E-02	3.74E-05	3.74E-05	4.80E-04	3.74E-05	3.74E-05
Zr-93									
Nb-93m									
Nb-94									
Tc-99				1.69E-06					
Cd-113m									
Sn-121m									
Sn-126									
I-129				6.47E-08					
Cs-135									
Cs-137				1.43E+00	3.74E-05	3.74E-05	4.80E-04	3.74E-05	3.74E-05
Ba-133				4.55E-04					
Sm-151				4.37E-09					
Eu-152				1.16E-01					
Eu-154				3.81E-03					
Ra-226				1.49E-04					
Ra-228				1.01E-05					
Th-229				2.83E-11					
Th-230				2.57E-06					
Th-232				1.11E-05					
Pa-231				2.32E-07					
U-232				1.86E-07					
U-233				1.17E-05					
U-234				1.05E-03	4.96E-05	4.96E-05		4.96E-05	4.96E-05
U-235				4.74E-05	2.22E-06	2.22E-06		2.22E-06	2.22E-06
U-236				9.02E-06					
U-238				5.12E-04	4.82E-05	4.82E-05		4.82E-05	4.82E-05
Np-237				1.17E-05					
Pu-238				1.01E-05					
Pu-239				1.10E-05					
Pu-240				6.81E-05					
Pu-241				6.32E-09					
Pu-242				1.66E-08					
Pu-244									
Am-241				3.10E-05					
Am-243				4.45E-05					
Cm-243									
Cm-244				1.69E-02					

LLW Alternative

Rep Site Name:	Oak Ridge	Oak Ridge	Oak Ridge	Pantex	Pantex	Pantex	Portsmouth	Princeton	Princeton
Stream Name:	5024: LLW/Debris/Other Solids	5033: LLW/Soil/Sludge/Sediment	5035: LLW/Soil/Sludge/Sediment	3597: Organic Liquids	3599: Solidified Water	3605: Inorganic Liquid	4074: LLW Incinerable Soft Solids	3927: Non-Compactable LLW	3928: Compacted Waste
Source Site:	Oak Ridge	Oak Ridge	Oak Ridge	Pantex	Pantex	Pantex	Portsmouth	Princeton	Princeton
FY00+ Disp:	123	1,500	1,548				6,969	500	200
Profile Source:	Rev.1 p. D2-OR-3	Rev.1 p. D2-OR-3	Rev.1 p. D2-OR-3	Reported in 6/26/00 SDD	Reported in 6/26/00 SDD	Reported in 6/26/00 SDD	Rev.1 p. D2-OR-7	Reported in 6/26/00 SDD	Reported in 6/26/00 SDD
H-3				9.01E-04	9.73E-19	9.01E-04		8.50E+02	9.47E-01
C-14									
C-14m									
Al-26									
Cl-36									
K-40									
Co-60								5.00E-03	5.00E-03
Ni-59									
Ni-63									
Ni-63m									
Se-79									
Sr-90	3.74E-05	3.74E-05	3.74E-05						
Zr-93									
Nb-93m									
Nb-94									
Tc-99							4.98E-05		
Cd-113m									
Sn-121m									
Sn-126									
I-129									
Cs-135									
Cs-137	3.74E-05	3.74E-05	3.74E-05						
Ba-133									
Sm-151									
Eu-152									
Eu-154									
Ra-226									
Ra-228									
Th-229									
Th-230									
Th-232									
Pa-231									
U-232									
U-233									
U-234	4.96E-05	4.96E-05	4.96E-05						
U-235	2.22E-06	2.22E-06	2.22E-06				1.81E-07		
U-236									
U-238	4.82E-05	4.82E-05	4.82E-05	2.25E-04		2.25E-04	6.81E-04		
Np-237									
Pu-238									
Pu-239									
Pu-240									
Pu-241									
Pu-242									
Pu-244									
Am-241									
Am-243									
Cm-243									
Cm-244									

MLLW Alternative

Rep Site Name:	Idaho	Idaho	Idaho	Idaho	Lawrence Berkeley	Los Alamos	LEHR	Nevada Test Site	Oak Ridge
Stream Name:	2482: WAG 1 MLLW TREATED/CDF	2471: WAG 5 MLLW ICDF	3629: ER TSCA Labpacks in Storage at WROC	4337: WAG 3 MLLW ICDF	1762: [Treated] Tritiated Water on Gal	3910: MLLW - Disposal	4117: Southwest Trench poly buck disposal	2868: Piceance	4400: DRS - K1420 Liquids (WW-02)
Source Site:	TBD	Idaho	Idaho	Idaho	Lawrence Berkeley	TBD - Off-Site	LEHR	Nevada Test Site	Oak Ridge
FY00+ Disp:	42	3,780	3	23,412	0.1	8	0.36	0.04	2
Profile Source:	Composite of SDD profiles for streams destined to ICDF	Reported in 6/26/00 SDD	Rev.1 p. D1-ID-8	Reported in 6/26/00 SDD	Rev.1 p. D1-OK-2	Rev.1 p. D1-AL-14	Rev.1 p. D2-OK-10	Reported after 6/26/00 SDD	Rev.1 p. D2-OR-3
H-3			8.71E-06		8.51E+01	1.07E+04	3.95E-06		
C-14					1.68E-04	1.49E-04			
C-14am			3.49E-04			5.99E-04			
Al-26						1.21E-07			
Cl-36									
K-40			3.53E-04			4.72E-06			
Co-60			8.76E-03			1.15E-03			
Ni-59						3.49E-04			
Ni-63			6.68E-06						
Ni-63am									
Se-79									
Sr-90	1.98E-04		2.43E-04	8.85E-04		3.75E-04	3.92E-04		3.74E-05
Zr-93						5.92E-07			
Nb-93m									
Nb-94						5.63E-07			
Tc-99			1.88E-06			1.84E-02			
Cd-113m			1.22E-05			3.77E-06			
Sn-121m									
Sn-126									
I-129						1.95E-08			
Cs-135									
Cs-137	5.06E-03	1.02E-05	1.03E-01	1.73E-02	3.34E-03	1.13E-03	2.79E-07		3.74E-05
Ba-133						7.56E-08			
Sm-151			1.32E-04			4.06E-05			
Eu-152	2.84E-04		3.89E-06			9.31E-03			
Eu-154	2.21E-04		5.50E-05	7.86E-05		1.55E-03			
Ra-226	2.37E-06	6.60E-07	7.21E-06		5.89E-10	1.68E-07	5.56E-06		
Ra-228						1.10E-05			
Th-229					3.09E-10				
Th-230			3.48E-08			2.49E-06			
Th-232			3.49E-08		3.10E-05	1.92E+00	4.25E-06		
Pa-231					4.63E-11				
U-232			7.05E-11			5.29E-08			
U-233			1.65E-07		2.02E-06	3.73E-10			
U-234			2.66E-04		4.57E-10	3.46E-04		6.63E-04	4.96E-05
U-235			5.79E-06		1.73E-09	1.13E-03			2.22E-06
U-236									
U-238			1.67E-04		1.76E-07	5.67E-01		7.18E-03	4.82E-05
Np-237			2.54E-06		6.30E-07	6.72E-06			
Pu-238			8.77E-07		1.52E-05	2.58E-02			
Pu-239	3.36E-07		7.03E-07		1.19E-05	6.04E-02			
Pu-240						6.34E-05			
Pu-241						9.41E-04	2.23E-04		
Pu-242						3.07E-08			
Pu-244									
Am-241	2.68E-06		5.13E-06	1.19E-05	2.83E-05	4.18E-02			
Am-243					1.46E-08	1.96E-06			
Cm-243									
Cm-244			2.43E-08						

Rep Site Name:	Oak Ridge	Portsmouth	Portsmouth	Portsmouth	Rocky Flats	Rocky Flats	Savannah	Savannah	Savannah
Stream Name:	4401: DRS - K1420 Debris (MW-004)	1978: Incinerable Solids (to TBD)	1983: Incinerable Solids (to TBD)	478: TSCA Soft Solids	3993: Disposal Sort to Class C Disposal	4260: Disposal Sort to DOE LLW Disposal	1908: Meets treatment standard	1912: CIF Stabilized Ash/Blowdown with Listed Constituents	1918: Macroencapsulated Waste
Source Site:	Oak Ridge	Portsmouth	Portsmouth	Portsmouth	Rocky Flats	Rocky Flats	Savannah	Savannah	Commercial - TBD
FY00+ Disp:	93	818	83	309			65	2,101	613
Profile Source:	Rev.1 p. D2-OR-3	Rev.1 p. D2-OR-7	Rev.1 p. D2-OR-7	Rev.1 p. D2-OR-7	Assume 50 % of Class C max concentrations from 10CFR61.55 only nucl from Rev.1 profiles	Rev.1 p. D2-RF-5	Reported after 6/26/00 SDD	Reported in 6/26/00 SDD	Reported after 6/26/00 SDD
H-3						1.71E-03	1.18E+01	3.90E+00	1.18E+01
C-14							8.82E-09		8.82E-09
C-14am									
Al-26									
Cl-36							4.46E-09		4.46E-09
K-40							6.64E-09		6.64E-09
Co-60							3.69E-04		3.69E-04
Ni-59							3.58E-06		3.58E-06
Ni-63							2.22E-04		2.22E-04
Ni-63am									
Se-79							1.75E-06		1.75E-06
Sr-90	3.74E-05				3.50E+03	2.30E-10	2.45E-03		2.45E-03
Zr-93							3.49E-10		3.49E-10
Nb-93m							5.69E-08		5.69E-08
Nb-94							1.97E-13		1.97E-13
Tc-99		4.98E-05	4.98E-05	4.98E-05			2.05E-06		2.05E-06
Cd-113m									
Sn-121m									
Sn-126							1.81E-08		1.81E-08
I-129							1.02E-06		1.02E-06
Cs-135							2.91E-14		2.91E-14
Cs-137	3.74E-05				2.30E+03	8.26E-09	2.65E-03		2.65E-03
Ba-133							1.53E-10		1.53E-10
Sm-151							3.97E-09		3.97E-09
Eu-152							1.61E-04		1.61E-04
Eu-154							1.17E-04		1.17E-04
Ra-226						2.99E-09	8.50E-09		8.50E-09
Ra-228							2.49E-07		2.49E-07
Th-229									
Th-230							1.60E-07		1.60E-07
Th-232							1.86E-07		1.86E-07
Pa-231									
U-232							4.50E-07		4.50E-07
U-233						1.53E-06	2.06E-05		2.06E-05
U-234	4.96E-05					7.70E-05	2.00E-04		2.00E-04
U-235	2.22E-06	1.61E-07	1.61E-07	1.61E-07		3.71E-06	6.93E-06		6.93E-06
U-236							1.42E-06		1.42E-06
U-238	4.82E-05	6.81E-04	6.81E-04	6.81E-04		6.48E-05	3.02E-04		3.02E-04
Np-237							7.71E-07		7.71E-07
Pu-238							1.59E-04		1.59E-04
Pu-239					5.00E+01	4.40E-03	6.95E-05		6.95E-05
Pu-240						1.13E-05	2.02E-05		2.02E-05
Pu-241					1.75E+03		8.49E-04		8.49E-04
Pu-242							3.23E-07		3.23E-07
Pu-244							8.59E-20		8.59E-20
Am-241						1.05E-03	2.43E-05		2.43E-05
Am-243							3.14E-08		3.14E-08
Cm-243							5.87E-10		5.87E-10
Cm-244							3.00E-05		3.00E-05

Nevada Test Site, *Nevada Test Site Waste Acceptance Criteria*, DOE/NV-325, Revision 2

Oak Ridge National Laboratory, *Performance Assessment for Continuing and Future Operations at Solid Waste Storage Area 6*, DOE/OR/01-1913/V1

Oak Ridge National Laboratory (ORNL), *Composite Analysis for Solid Waste Storage Area 6*, Lockheed Martin Energy Research Corp, ORNL-6929, 1997.

Parsons, *Technical Site Information: Fernald Environmental Management Project*, Rev. 0, Prepared by Parsons for Fernald Environmental Restoration Management Corporation, Fairfield, OH, September 1993.

Price, L.L., and F.A. Durán, *Characteristics of Special-Case Wastes Potentially Destined for Disposal at the Nevada Test Site*, SAND94-2106, Sandia National Laboratory, Albuquerque, NM, 1994.

U.S. Department of Energy, *Analysis of the Technical Capabilities of DOE Sites for Disposal of Residuals from the Treatment of Mixed Low-Level Waste.* SAND97-1098. Albuquerque, NM: Sandia National Laboratories for the U. S. Department of Energy, Office of Waste Management, Federal Facility Compliance Act Disposal Workgroup, 1997.

Savannah River Site, *Radiological Performance Assessment for the E-Area Vaults Disposal Facility*, WSRC-RP-94-218, Revision 1

Savannah River Site, *E-Area Vaults Low-Level Radioactive Solid Waste Acceptance Criteria*, WSRC 1S, Procedure 3.10, Revision 2

Savannah River Site, *SRS Radioactive Soil and Rubble Management Program and Waste Acceptance Criteria*, WSRC 1S, Procedure 3.15, Revision 1

Savannah River Site, *SRS Waste Acceptance Criteria Manual, Low-Level Radioactive Waste Acceptance Criteria*, WSRP Procedure WAC 3.17, Revision 3

U.S. Department of Energy, *Performance Assessment for Continuing and Future Operations at Solid Waste Storage Area 6*, ORNL-6783/R1, Oak Ridge National Laboratory for the U.S. Department of Energy, Oak Ridge, TN, September 1997.

U.S. Department of Energy, *The Current and Planned Low-Level Waste Disposal Capacity Report*, Revision 0, July 30, 1996.

U.S. Department of Energy, *The Current and Planned Low-Level Waste Disposal Capacity Report*, Revision 1, September 18, 1998.

U.S. Department of Energy, *Framework For DOE Low-Level and Mixed Low-Level Waste Disposal: Current Overview*, DOE/ID-10484, June 1994.