Quantities and Characteristics of the Contact-Handled Low-Level Mixed Waste Streams for the DOE Complex

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Quantities and Characteristics of the Contact-Handled Low-Level Mixed Waste Streams for the DOE Complex

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ABSTRACT

This report supports the Integrated Thermal Treatment System (ITTS) Study initiated by the Department of Energy (DOE) Office of Technology Development (EM-50), which is a system engineering assessment of a variety of mixed waste treatment processes. The DOE generates and stores large quantities of mixed wastes that are contaminated with both chemically hazardous and radioactive species. The treatment of these mixed wastes requires meeting the standards established by the Environmental Protection Agency for the specific hazardous contaminants regulated under the Resource Conservation and Recovery Act while also providing adequate control of the radionuclides.

The thrust of the study is to develop preconceptual designs and life-cycle cost estimates for integrated thermal treatment systems ranging from conventional incinerators, such as rotary kiln and controlled air systems, to more innovative but not yet established technologies, such as molten salt and molten metal waste destruction systems. Prior to this engineering activity, the physical and chemical characteristics of the DOE low-level mixed waste streams to be treated must be defined or estimated. This report describes efforts to estimate the DOE waste stream characteristics.

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ACRONYMS AND ABBREVIATIONS

Abs	absorbed
AEC	Atomic Energy Commission
ANL-E	Argonne National Laboratory-East
Aque	aqueous
BNL	Brookhaven National Laboratory
CH	contact-handled
DOE	Department of Energy
EPA	Environmental Protection Agency
ER/WM	Environment Restoration and Waste Management
ETEC	Energy Technology Engineering Center
FEMP	Fernald Environmental Management Project
FRP	fiberglass reinforced polyester
Halo	halogenated
HS	Hanford Site
IDB	Integrated Database
INEL	Idaho National Engineering Laboratory
Inorg	inorganic
ITTS	Integrated Thermal Treatment System
LANL	Los Alamos National Laboratory
α -LLMW	alpha low-level mixed waste
LLMW	low-level mixed waste
LLNL	Lawrence Livermore National Laboratory
mat	material
MSP	Middlesex Sampling Plant
MWIR	Mixed Waste Integrated Report
N.O.S.	not otherwise specified
org	organic
ORNL	Oak Ridge National Laboratory
PE	polyethylene
PGDP	Paducah Gaseous Diffusion Plant
PP	polypropylene
PVC	polyvinyl chloride

PXP	Pantex Plant
PORTS	Portsmouth Gaseous Diffusion Plant
PSNS	Puget Sound Naval Shipyard
RCRA	Resource Conservation and Recovery Act
R&D	research and development
RFP	Rocky Flats Plant
RH	remote-handled
SNL	Sandia National Laboratory
SRS	Savannah River Site
TC	toxic
TFE	teflon
TSCA	Toxic Substance Control Act
TRU	transuranic
WSS	Weldon Spring Site

Quantities and Characteristics of the Contact-Handled Low-Level Mixed Waste Streams for the DOE Complex

1.0 INTRODUCTION

The Department of Energy (DOE) generates and stores large quantities of mixed wastes, which contain both chemically hazardous and radioactive species. Treatment of these mixed wastes must meet standards established by the Environmental Protection Agency (EPA) for specific hazardous contaminants regulated under the Resource Conservation and Recovery Act (RCRA) while also providing adequate control of the radionuclides. In May 1993, the DOE Office of Technology Development (EM-50) initiated the Integrated Thermal Treatment System (ITTS) Study, a system engineering assessment of a variety of mixed waste treatment processes. The thermal treatment systems included in the ITTS Study range from conventional incinerators, such as rotary kiln and controlled air systems, to more innovative but not yet established technologies, such as molten salt and molten metal waste destruction systems.¹ The thrust of the study is to develop preconceptual designs and life-cycle cost estimates for a range of integrated thermal treatment systems. To do this, the physical and chemical characteristics of the DOE waste streams to be treated must be defined or estimated. This report describes the effort to estimate the DOE waste stream characteristics.

Much of the waste stored throughout the DOE complex was generated prior to the promulgation of current regulations. While several databases and waste volume inventories have been prepared during the past years, the purpose in developing them has usually been to meet regulatory requirements for the identification of specific contaminants. For these and other reasons, detailed data on the physical characteristics of the waste (bulk materials and contaminants) are not generally available.

The most current waste information is contained in *U.S. Department of Energy Interim Mixed Waste Inventory Report: Waste Streams, Treatment Capacities and Technologies* (MWIR report).² This report is the most complete and up to date effort by DOE to estimate waste inventories and categories (an update to this report is in preparation and will be published in the first half of 1994). Unfortunately, this inventory does not provide the detail from which one can directly calculate the elemental composition (C, O, N, H, Cl, S, F, and inerts) required to perform engineering mass and energy balances for waste treatment systems. For the ITTS Study, this report was used to derive

(using engineering judgement and process knowledge where available) the physical matrices^a of the wastes, which in turn were used to generate the elemental analysis contained within the ITTS Study LLMW Characterization Database. It is recognized that this database is not completely accurate, but it is believed to be adequate for the ITTS Study objectives, which are summarized below:

- Identify candidate mixed waste thermal treatment systems and perform a preconceptual design for each of these.
- Evaluate life-cycle costs for such treatment systems, including the preparation of residues for disposal and cost for disposal.
- Identify research and development needed to support the deployment of the most attractive systems.

As improvements to the DOE mixed waste inventory database are generated through site characterization efforts and other programs, the ITTS Study will be updated as appropriate.

The Idaho National Engineering Laboratory (INEL) waste stream information was obtained from two EG&G Idaho, Inc. reports that contained more detailed waste characterization information than required for the MWIR report, *Identification of a Treatment Process for the Idaho Waste Processing Facility Project -- A Preconceptual Design Study*^b and *INEL Radioactive Waste Stream Characterization Data (DRAFT)*.³ The *Preconceptual Design Study* used a 1991 baseline. Since no waste generation rates were provided in this report, the INEL generation rates listed in the MWIR report were used to adjust the INEL data to the 1992 baseline.

The ITTS Study LLMW Characterization Database includes data from twenty DOE facilities, listed in Table 1.1. Certain waste streams, such as the Hanford tank waste and the Rocky Flats Plant solar pond liquids, have been excluded from the database as these waste streams are being addressed using other processes that are more suitable than thermal treatment. By including the major waste

a. The physical matrix is the material that is contaminated with hazardous substances or radioactive elements, e.g. a piece of cloth.

b. Roesener, W.S.; Soelberg, N.R.; Ayers, A.L., Jr.; *Identification of a Treatment Process for the Idaho Waste Processing Facility Project -- A Preconceptual Design Study*, unpublished work.

Table 1.1 DOE Facilities Included in the ITTS Study LLMW Characterization Database

Argonne National Laboratory--East	Oak Ridge National Laboratory, K-25 Site
Brookhaven National Laboratory	Oak Ridge National Laboratory, Y-12
	Plant
Energy Technology Engineering Center	Paducah Gaseous Diffusion Plant
Fernald Environmental Management Project	Pantex Plant
Hanford Site	Portsmouth Gaseous Diffusion Plant
Idaho National Engineering Laboratory	Puget Sound Naval Shipyard
Lawrence Livermore National Laboratory	Rocky Flats Plant
Los Alamos National Laboratory	Sandia National Laboratory
Middlesex Sampling Plant	Savannah River Site
Oak Ridge National Laboratory	Weldon Spring Site

streams ($>5 \text{ m}^3$) from each of the twenty facilities, the ITTS Study database encompasses 99.7% of the total contact-handled low-level mixed waste streams currently stored throughout the DOE complex (as reported in the MWIR report). This percentage was calculated using the formula in Table 1.2.

Stored waste volumes (m^3) were used to calculate this percentage since most of the sites reported their wastes in volumes. The only site which did not report volumes for its stored wastes was the Portsmouth Gaseous Diffusion Plant (PORTS). The MWIR report converted the PORTS total waste quantity (kg) into a volume by using a generic density conversion. For the ITTS Study database, a density conversion value estimated for each waste stream was assigned to each of the PORTS waste streams. These two different approaches for assigning densities resulted in different volumes for the PORTS wastes. This volume difference is subtracted in the formula shown in Table 1.2. The ITTS Study database includes only contact-handled waste streams.

It was found that the physical matrices (wood, paper, building materials, sludges, etc.) of many of the DOE waste streams have not yet been defined. The physical waste matrix is the main information needed for determining an appropriate waste treatment technology. Therefore, using the best available information (i.e., waste descriptions and process knowledge), the DOE waste streams were segregated into their appropriate physical waste matrices.

Table 1.2 Calculation of the Percentage of Contact-Handled DOE Low-Level Mixed Wastes Included in the ITTS Study Database

	Vol. from MWIR Report (247,036 m ³)	—	INEL LLMW from MWIR Report (23,216 m ³)	—	RH LLMW from MWIR Report (44,381 m ³)	—	Hanford Tank Waste (40,086 m ³)
—	RFP Solar Pond Waste (45,425 m ³)	+	Difference in PORTS due to density (1,639 m ³)	+	INEL CH LLMW from EG&G Report (18,655 m ³)	=	Possible Amount of Waste for inclusion in ITTS Study database (114,222 m ³)
	Vol. from ITTS (113,901 m ³)	÷	Possible Amount of Wastes (114,222 m ³)	x	100	=	99.7%

These physical waste matrices were used to perform an elemental analysis using generally accepted elemental analysis data. From the elemental analysis, the heat value, inert fraction, moisture content, and acid gas precursors were calculated for each waste stream.

2.0 WASTE CHARACTERISTICS

The ITTS Study LLMW Characterization Database is not a simple replica of other DOE waste inventory databases. This database breaks down each nominal waste stream into what are believed to be its principal physical matrices (i.e., the bulk materials). The physical matrices are the main drivers for selecting the appropriate treatment technology. This matrix information is, in turn, converted to elemental compositions. Elemental compositions are necessary to calculate mass and energy balances for the treatment processes. As stated in Section 1.0, DOE waste stream information has not been fully developed at the physical level. Much of the information reviewed contained data on the trace constituents that made the waste hazardous, but there is very little information on the major components (physical matrices) of the waste; many DOE sites' waste characterization activities have not yet been completed. For the purpose of the ITTS Study database, engineering judgement was used to estimate the waste matrices where data were not available.

One of the challenges of compiling the waste stream data was to convert all of the data to a single format that would facilitate transformation of listed descriptions into elemental compositions. The primary source of waste stream information was the MWIR report.² Most of these data were based on waste quantities through the end of 1992, although data for some sites were only valid through 1991. In these cases, annual generation rates were used to convert the data to the 1992 baseline. Since the database was to be linked to a mass balance program, the information needed to be in mass units. Consequently, bulk densities had to be estimated for the waste streams for which mass units were not reported. Bulk density estimations are documented within the database.

2.1 Container Selection

It was unclear in the MWIR report whether the waste masses listed included container mass or not. It was assumed that the mass for most of the waste streams included the container mass. An INEL study^c indicated that 55-gallon steel drums are the dominant container at the INEL, and that 4x4x7 FRP (fiberglass reinforced polyester) wooden boxes represent the majority of the remaining waste containers. This was used as the basis for the container selection distribution for the remaining DOE sites included in the ITTS Study LLMW Characterization Database. Container types were

c. Hyde, R. A., EG&G Idaho, Inc., letter to Fred Feizollahi of M-K Environmental Services, Inc., March 10, 1992.

assigned based on the waste characteristics (i.e., high density, powder, or liquid wastes were assigned to drums and the remaining wastes were assigned to FRP boxes). If information becomes available on the actual container type, the data can be easily updated. Since the total estimated container mass is a substantial fraction of the total mass, the ITTS Study included container processing as part of the waste feed stream. The database is currently limited to two container types, drums and FRP boxes.

The specifications for the drums were obtained from an EG&G Idaho report.^b Drums have a tare weight of 23.6 kg and a 5.8 kg polyethylene (PE) liner. FRP boxes were assumed to be 57% wood, 40% glass, and 3% PE; no differentiation is made between the polyethylene of the liner and the polyester coating, both are assumed to be PE.⁴ The polyethylene liner, wood, and resin were included in the combustible waste, while the steel and the fiberglass were included in the non-combustible waste.

2.2 Physical Matrix Distribution

The physical waste matrix is the main factor used in determining the appropriate waste treatment technology. Therefore, using the best available information (i.e., waste descriptions and process knowledge), the DOE waste streams were segregated into assumed physical waste matrices. The MWIR report's waste profile sheets were used to obtain generic waste stream descriptions and the EPA waste codes were used to determine the hazardous contaminants for each waste stream.

The INEL waste stream data, obtained from the EG&G Idaho report,^b were already broken down into resolvable physical matrices. The matrices list from this report was used as the initial matrix list for the ITTS Study LLMW Characterization Database. Other matrices were added to the database as needed while entering data from the MWIR Report (See Table 2.1).

Assigning waste matrix distributions to the waste stream data from the MWIR Report was difficult. The descriptions of the individual waste streams are frequently nebulous and involve mixtures of numerous materials. Should future revisions to the MWIR report include additional information that clarifies the actual waste matrix distribution of a given waste stream, the new distribution can be entered into the database and a revised elemental analysis can be generated. In spite of the inevitable uncertainties associated with the generation of the present database, it is judged to be suitable to meet objectives of the ITTS Study.

Table 2.1 Selected Waste Matrices Contained within the ITTS Study Database

Glass Raschig Ring	Wood	Absorbed Organic
Misc. Glass	Cardboard	Absorbed Inorganic
Bulk (nontoxic) Metal	Organic Sludge	Soil/Dirt
Bulk Cadmium	Inorganic Sludge	Flooring Material
Bulk Barium	Cemented Organic Sludge	Asphalt
Uranium Compounds	Cemented Inorganic Sludge	Sheetrock
Beryllium	Cemented Resins	Concrete
Paint Residue	Resins	Metal Fines & Turnings
Lead Shielding	Leaded Rubber	Diatomaceous Earth
Rubber	Ceramics (Molds & Crucibles)	Bulk Mercury
Paper	Firebrick	Incinerator Ash
Cloth	Salts	Organic Labpacks
Oil	Halide Salts	Inorganic Labpacks
Plastic	Sulfate Salts	Tantalum (INEL)
PE/PP	Nitrate Salts	Non-Halogenated Organic Liquids
PVC	Aqueous Organics	Halogenated Organic Liquids
TFE	Aqueous Toxic Metals	Graphite
Batteries (Pb, Cd)	Aqueous Cyanides	

2.3 Elemental Composition

All waste matrices were converted to their elemental compositions, which are needed to calculate mass and energy balances for the treatment processes. The elemental composition breakdowns for each physical matrix were obtained from numerous references.^{4,5,6,7,8,9,10,11,12,d} All sources of information used to generate the elemental compositions are documented within the database. Table 2.2 presents the elemental break-down used for each physical matrix identified within the ITTS Study database.

d. Personal communication with Texaco technical personnel.

Table 2.2. Elemental Composition Breakdown for each Physical Matrix

Physical Waste Matrix	Organic Composition (wt. %)										Inorganic Composition (wt. %)										Total		
	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Chlorine	Fluorine	NO	SO ₂	Water	Glass Forming Inerts	Bulk Metal	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)	Silver (Ag)	Tantalum (Ta)	Uranium (U-238)
Absorbed Inorganics	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	70.00%	0.00%	0.20%	0.10%	0.00%	1.50%	2.00%	0.50%	0.50%	0.10%	0.10%	0.00%	0.00%
Absorbed Organics	12.55%	1.21%	0.00%	0.00%	0.00%	16.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aqueous Cyanides	0.02%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	99.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aqueous Organics	1.08%	0.10%	0.00%	0.00%	0.00%	0.82%	0.00%	0.00%	0.00%	98.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aqueous Toxic Metals	0.00%	0.13%	6.09%	1.78%	0.00%	0.00%	0.00%	0.00%	0.00%	87.00%	0.00%	0.00%	0.00%	0.10%	0.00%	1.50%	2.00%	0.50%	0.50%	0.10%	0.10%	0.00%	0.00%
Asbestos	13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	86.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Asphalt	16	8.41%	1.49%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	90.00%	0.00%	0.79%	0.00%	0.00%	0.00%	0.20%	0.01%	90.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Batteries	0.95%	0.24%	2.54%	0.00%	1.27%	0.00%	0.00%	0.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%	36.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Beryllium	0.00%	0.00%	63.97%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bulk (nontoxic) Metals	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bulk Barium	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bulk Cadmium	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bulk Mercury	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cardboard	41.47%	5.80%	46.04%	0.10%	0.09%	0.00%	0.00%	0.00%	0.00%	5.00%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cemented Inorganic Sludge	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.50%	91.75%	0.00%	0.00%	0.00%	0.00%	0.25%	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cemented Organic Sludge	18	35.13%	5.97%	0.00%	0.00%	0.04%	5.36%	0.00%	0.00%	3.80%	46.20%	2.50%	0.00%	0.25%	0.00%	0.25%	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cemented Resins	13	20.11%	2.38%	2.44%	0.00%	0.00%	0.00%	0.00%	0.00%	28.80%	46.20%	0.00%	0.00%	0.00%	0.00%	0.03%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ceramic	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cloth	41.47%	5.80%	46.04%	0.10%	0.09%	0.00%	0.00%	0.00%	0.00%	5.00%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Concrete	18	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.60%	92.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Diatomaceous Earth	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.00%	85.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Firebrick	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Flooring Materials	19	47.05%	5.27%	18.28%	0.10%	0.39%	0.00%	0.00%	0.00%	2.10%	26.81%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Glass Recycling Rings	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Graphite	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Halide Salts	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	38.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Halogenated Organic Liquids	14.94%	1.59%	0.00%	0.00%	0.00%	83.47%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Incinerator Ash	8.82%	0.00%	2.75%	0.00%	1.53%	4.20%	0.00%	0.00%	0.00%	1.49%	88.91%	0.00%	0.08%	0.10%	0.00%	0.07%	0.05%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%
Inorganic Labpacks	1.06%	0.22%	2.11%	0.62%	0.00%	0.00%	0.00%	0.00%	0.00%	44.00%	55.25%	0.00%	0.00%	0.00%	0.00%	0.25%	0.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Inorganic Sludge	17	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lead Shielding	13	2.79%	0.35%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	96.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Leaded Rubber	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Metal Fines & Turnings	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Miscellaneous Glass	12	0.50%	0.10%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	99.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Nitrate Salts	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	35.50%	0.00%	0.00%	64.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Non-Halogenated Organic Liquids	80.14%	8.81%	11.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Oil	82.52%	12.99%	0.00%	0.00%	0.49%	0.00%	0.00%	0.00%	0.00%	0.00%	88.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Organic Labpacks	10.87%	1.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Organic Sludge	64.22%	10.91%	0.00%	0.00%	0.07%	9.79%	0.00%	0.00%	0.00%	5.00%	3.00%	5.00%	0.00%	0.50%	0.00%	0.50%	1.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paint Residue	12	3.99%	0.57%	0.31%	0.12%	0.00%	0.00%	0.00%	0.00%	9.00%	85.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paper	11.12	41.47%	5.80%	46.04%	0.10%	0.09%	0.00%	0.00%	0.00%	5.00%	1.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Polyethylene, Polypropylene	11	85.28%	14.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Plastic N.O.S.	73.17%	11.90%	0.00%	0.03%	0.02%	13.39%	0.00%	0.00%	0.00%	0.50%	8.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Polyvinyl chloride	11.12	36.82%	4.64%	0.00%	0.11%	0.09%	54.34%	0.00%	0.00%	2.00%	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Resins	13	40.22%	4.76%	4.87%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Rubber	13	69.89%	8.80%	0.00%	0.00%	1.31%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Salts	0.00%	0.00%	0.00%	0.00%	0.00%	20.96%	0.00%	0.00%	11.71%	15.03%	0.00%	53.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Shetrock	2.07%	0.29%	28.78%	0.00%	17.70%	0.00%	0.00%	0.00%	0.00%	20.13%	31.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Soil	0.96%	0.12%	0.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	8.08%	86.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sulfate Salts	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	45.54%	0.00%	54.47%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Tantalum	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Teflon	11	23.54%	1.98%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Uranium Compounds	0.00%	0.00%	15.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wood	41.47%	5.80%	46.04%	0.10%	0.09%	0																	

2.4 Radiological Distribution

One of the essential pieces missing in the waste inventory puzzle is radionuclide information. Unfortunately, a document listing chemical, physical, and radionuclide data for the waste streams was not found.^{2,3,7,13,14,15,b} Waste stream information listed in documents that focus on radionuclide contamination were found not to correspond with waste stream information listed in documents that focus on chemical contamination.

General radioactivity information was obtained from the Integrated Database (IDB) report.¹³ However, this report does not list specific radioactivity data for DOE low-level mixed wastes; therefore, the radioactivity information on low-level wastes was applied to the wastes in the LLMW Characterization Database.

Radionuclides selected for inclusion in the database are summarized in Table 2.3. The IDB Report placed the radionuclides into the following radiological categories: Alpha, Fission Products, Induced Activity, Tritium, Uranium/Thorium, and Other. The IDB report defines the "Other" category as containing unknown radionuclides and/or a mixture of radionuclides from multiple radiological categories. Assigning these data to a distribution of specific radionuclides was performed using information obtained from *"Radiation and Mixed Waste Incineration, Background Information Document Volume 2: Risks of Radiation Exposure"*¹⁵ and the MWIR waste profile sheets. The radiological distribution is based on the weight

Table 2.3 Radionuclides Included in the ITTS Study Database

Alpha	Fission Products	Induced Activity	Tritium
Am-241	Ba-137	Co-58	H-3
Pu-239	Ce-144	Co-60	
Pu-241	Cs-134	Cr-51	Uranium/Thorium
	Cs-137	Fe-59	Pa-234
	Nb-95	Mn-54	Th-234
	Pr-144	Tc-99	U-235
	Rh-106	Zn-65	U-238
	Ru-106		
	Sb-125		
	Sr-90		
	Te-125m		
	Y-90		
	Zr-95		
Other			
This category is made up of a combination of any of the above radionuclides.			

percent of the waste that is contaminated with the radionuclides contained within a radiological category.

2.5 Heating Value Calculations

The heating value for each waste stream was calculated based on the individual heating values for elemental carbon, hydrogen, sulfur, chlorine, and fluorine.⁶ After the amount of each elemental constituent was calculated, it was multiplied by its heating value. These values for each waste stream were summed and then divided by the total mass of the waste stream to obtain the average heating value for individual waste streams:

$$\text{Heating Value} = \frac{[(\text{mass C} \times 32,785 \text{ kJ/kg}) + (\text{mass H} \times 120,034 \text{ kJ/kg}) + (\text{mass S} \times 9,263 \text{ kJ/kg}) + (2 \times \text{mass Cl} \times 1,302 \text{ kJ/kg}) + (2 \times \text{mass F} \times 7,074 \text{ kJ/kg})] \div \text{total mass (kg)}}$$

2.6 Density Calculations

The density for each waste stream was either assumed based on descriptions given for individual waste streams or calculated if both the mass and volume were given. If the volume for a waste stream was not given, it was then calculated based on the number of drums and bins documented. Generic volumes representing a 55-gallon drum (0.208 m³) and an FRP box (3.17 m³) were used.

2.7 Moisture Content Determination

As part of the elemental composition breakdown, the amount of water contained in each individual physical matrix was calculated. The moisture content fraction was computed by dividing the amount of water present by the total mass of the waste stream.

2.8 Combustible Matter Determination

The amount of combustible matter in each waste stream was calculated using the physical matrices that contained the largest amount of organic material (combustibles). The physical matrices chosen are summarized in Table 2.4. In addition, the combustible portions of the drum liners and FRP boxes were also included in the combustible matter calculations. All of the chosen physical matrices, excluding absorbed organics and organic labpacks, had an organic composition of eighty percent or

Table 2.4 Combustible Physical Matrices

Rubber	Organic Labpacks	Cardboard
Paper	Halogenated Organic Liquids	Absorbed Organics
Cloth	Polyethylene/Polypropylene (PE/PP)	Non-Halogenated Organic Liquids
Oil	Polyvinyl chloride (PVC)	Graphite
Plastic N.O.S.	Teflon (TFE)	
Organic Sludge	Wood	

greater. Absorbed organics and organic labpacks were also identified as combustible materials because of the large variability in their waste make-up. For example, organic liquids can be absorbed into either an inorganic matrix (kitty litter) or an organic matrix (sawdust).

The masses of the chosen physical matrices plus the combustible portion of the containers were summed and then divided by the total mass of the waste stream to obtain the combustible fraction.

2.9 Acid Gas Precursor Calculations

The compounds chosen as acid gas precursors were sulfur, sulfur dioxide, chlorine, and fluorine. The mass of the above compounds was summed and then divided by the total mass of the waste stream to calculate the fraction that has the potential to produce acidic gases.

3.0 WASTE INVENTORIES

The ITTS Study LLMW Characterization Database provides an inventory of DOE's contact-handled LLMW. The reclassified TRU waste (α -LLMW) is also included in the ITTS Study database. The Rocky Flats Plant aqueous solar pond wastes and the Hanford Site tank wastes have been excluded from the ITTS Study database.

3.1 Argonne National Laboratory--East

Argonne National Laboratory--East (ANL-E) is a multi-program research and development laboratory located in Argonne, Illinois. Activities include nuclear reactor design, synchrotron radiation acceleration design, and environmental research programs.² ANL-E currently stores approximately 156,292,790 kg of contact-handled LLMW.

3.2 Brookhaven National Laboratory

Brookhaven National Laboratory (BNL) is operated for the DOE by Associated Universities, Inc. BNL is located in Brookhaven Township on Long Island, New York. The laboratory conducts basic and applied research in the physical, biomedical, and environmental sciences and selected energy technologies. Waste generating activities are laboratory experiments and the cleaning and maintenance of laboratory equipment.² BNL currently stores approximately 76,770 kg of contact-handled LLMW.

3.3 Energy Technology Engineering Center

Energy Technology Engineering Center (ETEC), located in southern California, develops energy technologies, and engineers, tests, and develops components related to liquid-metals technology in support of the DOE.² ETEC currently stores approximately 1,260,470 kg of contact-handled LLMW.

3.4 Fernald Environmental Management Project

The Fernald Environmental Management Project (FEMP) is located in southwestern Ohio. The FEMP facility was built to process uranium ore concentrates into high purity uranium-metal

products. A wide variety of chemical and metallurgical processing steps supported manufacturing of uranium-metal products for use at other DOE sites. On July 10, 1989, after more than 36 years of production, operations were suspended to refocus site resources on environmental restoration.² FEMP currently stores approximately 3,404,104 kg of contact-handled LLMW.

3.5 Hanford Site

The Hanford Site (HS) is located in south-central Washington, immediately northwest of Richland. Historically, the primary mission of the site was the production of special nuclear material for defense. Hanford no longer has a defense production role, and the mission is now environmental restoration and waste management (ER/WM), technology development for ER/WM, and research and development on related topics.² HS currently stores approximately 5,216,444 kg of contact-handled LLMW, excluding the tank wastes.

3.6 Idaho National Engineering Laboratory

The Idaho National Engineering Laboratory (INEL) is located in southeastern Idaho. The INEL was established in 1949 to conduct research and development on nuclear reactors and related equipment; since that time, 52 reactors have been built on-site and 12 are still operating or operable. The INEL is a multi-program laboratory whose primary mission is to provide the nation with innovations in nuclear technologies and unique scientific and engineering capabilities in non-nuclear programs that provide commercialization potential or enhance the quality of the environment.² INEL currently stores approximately 15,708,380 kg of contact-handled LLMW.

3.7 Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL) is located on the eastern edge of Livermore, California. LLNL is operated by the University of California for the DOE. Its primary mission is nuclear-weapons research and development, although LLNL also performs research on inertial confinement fusion, laser isotope separation, magnetic fusion energy, energy and resources, environmental restoration and waste management, and biomedical topics.² LLNL currently stores approximately 194,429 kg of contact-handled LLMW.

3.8 Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is located in Los Alamos County, New Mexico. LANL is operated for the DOE by the University of California. The prime mission of the laboratory is the design and development of nuclear weapons; however, considerable research and development (R&D) is directed toward controlled thermonuclear reactions, fission, nuclear safeguards, laser fusion, and medium energy physics. LANL has hazardous waste contaminated with activation or fusion products.² LANL currently stores approximately 1,149,677 kg of contact-handled LLMW.

3.9 Middlesex Sampling Plant

The Middlesex Sampling Plant (MSP) is located in Middlesex, New Jersey. The MSP facility was established in 1943 by the Manhattan Engineer District to sample, store, and/or ship uranium, thorium, and beryllium ores. In 1955, the Atomic Energy Commission (AEC) terminated the operation and later used the site for the storage and limited sampling of thorium residues. In 1967, the AEC activities ceased, on-site structures were decontaminated, and the site was certified for unrestricted use. Between 1968 and 1980, the site was used by the General Services Administration and the Department of Navy. In 1980, custody was returned to the DOE, which then initiated remedial action to clean up the vicinity properties and portions of the landfill into which radioactive materials previously had been disposed. Wastes resulting from the cleanup activities were transported to the MSP for interim storage.² MSP currently stores approximately 44,043,936 kg of contact-handled LLMW.

3.10 Oak Ridge National Laboratory

The Oak Ridge National Laboratory (ORNL) is located southwest of Oak Ridge, Tennessee. ORNL is a multipurpose research and development facility supporting energy technology through applied research in basic and physical sciences. These activities are conducted predominantly on small scales in over 900 individual R&D laboratories. These activities are diverse and frequently generate waste materials. Unlike production facilities that have well defined operations that produce consistent waste streams in large volumes, ORNL is characterized by numerous small, periodic operations that produce very large numbers of small volume waste streams.² ORNL currently stores approximately 311,473 kg of contact-handled LLMW.

3.11 Oak Ridge National Laboratory, K-25 Site

The Oak Ridge National Laboratory K-25 Site (ORNL K-25) is located southwest of Oak Ridge, Tennessee. ORNL K-25 was formerly known as the Oak Ridge Gaseous Diffusion Plant. The original mission of this site was the production of highly enriched uranium in support of the national defense programs; this site was later used to produce uranium hexafluoride for use as nuclear reactor fuel. The gaseous diffusion plant was shut down in 1987. ORNL K-25's mission now is primarily environmental restoration, waste management, and research and development of the advanced isotope-separation technology.

ORNL K-25 stores and treats wastes for the entire Oak Ridge Reservation (ORNL, Y-12, K-25) as well as off-site wastes (primarily from PORTS, PGDP, and FEMP) destined for the Toxic Substance Control Act (TSCA) incinerator.² ORNL K-25 currently stores approximately 39,924,779 kg of contact-handled LLMW.

3.12 Oak Ridge National Laboratory, Y-12 Plant

The Oak Ridge National Laboratory Y-12 Plant (ORNL Y-12) is located southwest of Oak Ridge, Tennessee. ORNL Y-12 was originally built, in 1943, for the separation of uranium isotopes as part of the Manhattan Project; its role was later changed to manufacturing and developmental engineering. ORNL Y-12's current mission is to serve as a manufacturing technology center for key processes associated with nuclear weapons components and other applications of national importance. In addition, the ORNL Y-12 mission includes environmental restoration and waste management.² ORNL Y-12 currently stores approximately 19,121,602 kg of contact-handled LLMW.

3.13 Paducah Gaseous Diffusion Plant

The Paducah Gaseous Diffusion Plant (PGDP) is located west of Paducah, Kentucky. The PGDP is operated for the DOE by Martin Marietta Energy Systems, Inc. The PGDP mission is to produce low-enrichment uranium for the nuclear power industry. Mixed waste has been generated as a result of operations conducted in performing this mission.² PGDP currently stores approximately 235,035 kg of contact-handled LLMW.

3.14 Pantex Plant

The Pantex Plant (PXP) is located northeast of Amarillo, Texas. Activities include weapons production, maintenance, and modification, and disassembly of weapons retired for stockpile.² PXP currently stores approximately 77,774 kg of contact-handled LLMW.

3.15 Portsmouth Gaseous Diffusion Plant

The Portsmouth Gaseous Diffusion Plant (PORTS) is located near Piketon, Ohio. Martin Marietta Energy Systems, Inc., operates the plant for DOE. The PORTS mission is to produce enriched uranium for the nuclear power industry. The following are mission-related PORTS activities that generate mixed waste:

- receipt and assay of UF₆ process feed material;
- staged, porous barrier, U-235 enrichment;
- assay and shipment of enriched U-235 product material;
- facility maintenance and other supporting activities;
- environmental restoration;
- decontamination and decommissioning of obsolete equipment and facilities.²

PORTS currently stores approximately 6,327,194 kg of contact-handled LLMW.

3.16 Puget Sound Naval Shipyard

Puget Sound Naval Shipyard (PSNS) is located on the west side of Sinclair Inlet on Puget Sound, south of Bremerton, Washington. The shipyard is a U.S. Navy facility that repairs, overhauls, and maintains Navy ships, including nuclear-powered ships. Activities relating to naval propulsion systems are performed in accordance with the requirements and authority of the Naval Nuclear Propulsion Program, a joint DOE and Department of the Navy program.² PSNS currently stores approximately 66,329 kg of contact-handled LLMW.

3.17 Rocky Flats Plant

The Rocky Flats Plant (RFP) is located northwest of Denver, Colorado. RFP's historical mission was to produce plutonium and other metal components for nuclear weapons. Production activities included metal working, fabrication, and component assembly, as well as chemical recovery and purification of transuranic radionuclides. The plant used specialized facilities for recovery of nuclear components from obsolete weapons. RFP's new mission is to clean and stabilize production process systems, decontaminate obsolete or excess buildings and facilities, and process plutonium residues in preparation for transport to storage or disposal sites. RFP currently stores approximately 15,438,854 kg of contact-handled LLMW, excluding the aqueous solar pond waste stream.

3.18 Sandia National Laboratory

The Sandia National Laboratory (SNL) is located immediately southeast of Albuquerque, New Mexico, on Kirtland Air Force Base. SNL's primary mission is conducting R&D in the interest of national security, with principal emphasis on development and engineering of non-nuclear components of nuclear weapons. Other programs include basic and applied research in the energy and materials sciences, nuclear waste management, and safeguards and security.² SNL currently stores approximately 9,076 kg of contact-handled LLMW.

3.19 Savannah River Site

The Savannah River Site (SRS) is located south of Aiken, South Carolina, along the Savannah River. The primary mission of the SRS is the production of plutonium, tritium, and other special nuclear materials. The following SRS activities generate mixed wastes:

- plutonium recovery through separation processes;
- processing of enriched and depleted uranium;
- laboratory analytical testing and research;
- tritium production;
- bioassay studies;
- facility maintenance and other supporting activities;

- decontamination and decommissioning of facilities;
- waste processing;
- environmental restoration.²

SRS currently stores approximately 3,505,594 kg of contact-handled LLMW.

3.20 Weldon Spring Site

Weldon Spring Site (WSS) is located west of St. Louis, Missouri. The site consists of a chemical plant and a limestone quarry. The U.S. Department of the Army used the chemical plant area as an ordnance works to produce nitroaromatic explosives in the 1940's, and the AEC processed uranium and thorium ores at the plant from 1957 to 1966. The EPA listed the quarry on its National Priorities List in 1987 and added the chemical plant area in 1989. The LLMW is composed of mostly drummed materials resulting from consolidation and containerization of waste chemicals abandoned at the facility.² WSS currently stores approximately 64,549 kg of contact-handled LLMW.

3.21 DOE Complex Totals

Table 3.1^e summarizes the quantities of contact-handled LLMW located at various DOE sites. The table category "net weights" represents the mass of only the wastes; the "total weight" category is the masses of both the waste and the containers. The drum mass includes both the weight of the drum (23.6 kg) and the weight of the polyethylene (PE) liner (2.8 kg). Tables 3.2 and 3.3 summarize the quantities of contact-handled LLMW contained in each waste category (the waste categories were obtained from the MWIR report). Table 3.4 summarizes the waste's physical characteristics that need to be known to adequately process the waste streams. These characteristics includes heat of combustion, density, moisture content, combustible matter, and acid gas precursors. Tables 3.5 and 3.6 summarize the elemental compositions of the DOE contact-handled LLMW streams. Table 3.7 summarizes the elemental composition for each physical matrix for the DOE complex.

e. For convenience in reading the text, the figures and tables for this chapter are given at the end of the report, beginning on page 22.

Figures 3.1 through 3.8 are various representations of the DOE complex LLMW. Figures 3.1 and 3.2 summarize the physical matrix distribution of the LLMW for the complex. Figures 3.3 and 3.4 identify the quantities of LLMW generated throughout the DOE complex. The Middlesex Sampling Plant (MSP) had the most LLMW as of December 31, 1992. Figures 3.5 and 3.6 graphically depict the combustible vs. noncombustible waste streams located throughout the DOE complex, with and without the drums and/or FRP boxes. The combustible fraction only changes 1% due to the combustible materials from the containers. Therefore, from here on, figures depicting the combustible vs. noncombustible waste streams will not include the containers. Figures 3.7 and 3.8 show the physical matrix distributions for the combustible and noncombustible wastes, respectively.

Figures 3.9 through 3.107 provide data on the LLMW streams for each of the sites, in alphabetical order. For each site, the first figure summarizes the physical matrix distribution for the LLMW, the second identifies the combustible portion of the LLMW, the third and fourth show the physical matrices that contribute to the combustible and noncombustible portions of waste streams, and the last identifies the radiological distribution for the LLMW stream at that site.

4.0 REFERENCES

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**Table 3.1. Quantities of Contacted-Handled Low-Level Mixed Wastes
Derived for the ITTS Study***

Facility	State	Net Weights (Kg)	Drums (Kg)	Bins (Kg)	Total Weight (Kg)
Total LLMW:		141,560,474	10,055,196	4,677,120	156,292,790
Argonne National Laboratory-East	Illinois	142,892	12,848	580	156,320
Brookhaven National Laboratory	New York	64,837	11,642	290	76,769
Energy Technology Engineering Center	California	1,173,844	85,466	1,160	1,260,470
Fernald Environmental Management Project	Ohio	2,987,064	415,010	2,030	3,404,104
Hanford Site	Washington	4,494,859	697,515	24,070	5,216,444
Idaho National Engineering Laboratory	Idaho	13,567,705	835,385	1,305,290	15,708,380
Lawrence Livermore National Laboratory	California	166,778	24,461	3,190	194,429
Los Alamos National Laboratory	New Mexico	1,063,295	67,532	18,850	1,149,677
Middlesex Sampling Plant	New Jersey	41,805,426	0	2,238,510	44,043,936
Oak Ridge National Laboratory	Tennessee	267,789	37,015	6,670	311,474
Oak Ridge National Laboratory, K-25 Site	Tennessee	35,645,796	4,263,323	15,660	39,924,779
Oak Ridge National Laboratory, Y-12 Plant	Tennessee	17,496,920	1,192,582	432,100	19,121,602
Paducah Gaseous Diffusion Plant	Kentucky	203,037	28,518	3,480	235,035
Pantex Plant	Texas	67,393	6,321	4,060	77,774
Portsmouth Gaseous Diffusion Plant	Ohio	5,477,490	577,975	271,730	6,327,195
Puget Sound Naval Shipyard	Washington	58,360	5,939	2,030	66,329
Rocky Flats Plant	Colorado	13,970,130	1,412,464	56,260	15,438,854
Sandia National Laboratories	New Mexico	1,801	6,115	1,160	9,076
Savannah River Site	South Carolina	2,851,122	364,472	290,000	3,505,594
Weldon Spring Site	Missouri	53,936	10,613	0	64,549
<i>The ITTS Database Represents 99.7% of the total Contact-Handled Low-Level Mixed Waste Streams Located Throughout the DOE Complex.</i>					

*Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg) and the RFP aqueous solar pond waste (45,425 Kg) were excluded.

**Table 3.2. Quantities of Contacted-Handled Low-Level Mixed Wastes per Waste Category
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Net Weights (Kg)	Drums (Kg)	Boxes (Kg)	Total Weight (Kg)	Density (Kg/m3)
Total CH LLMW	141,560,475	10,055,191	4,677,120	156,292,787	
Argonne National Laboratory-East					
<u>Site Total</u>	<u>142,893</u>	<u>12,847</u>	<u>580</u>	<u>156,320</u>	
Aqueous Liquids	2,638	441	0	3,079	993
Elemental Lead	60,912	0	580	61,492	11,387
Inorganic Sludge/Particulate	45,117	6,585	0	51,702	1,096
Lab Packs without Metals	30,460	4,586	0	35,046	1,082
Organic Debris	1,118	382	0	1,500	600
Organic Liquids	2,648	853	0	3,501	584
Brookhaven National Laboratory					
<u>Site Total</u>	<u>64,837</u>	<u>11,642</u>	<u>290</u>	<u>76,770</u>	
Elemental Lead	1,348	0	290	1,638	1,092
Inorganic Sludge/Particulate	44,196	7,673	0	51,869	957
Lab Packs with Metals	5,952	794	0	6,746	1,205
Multiple	1,070	853	0	1,923	321
Organic Liquids	12,271	2,323	0	14,594	890
Energy Technology Engineering Center					
<u>Site Total</u>	<u>1,173,844</u>	<u>85,466</u>	<u>1,160</u>	<u>1,260,470</u>	
Elemental Lead	55,420	0	580	56,000	11,200
Heterogeneous Debris	3,243	647	580	4,470	417
Soils	1,115,181	84,819	0	1,200,000	2,000
Fernald Environmental Management Project					
<u>Site Total</u>	<u>2,987,067</u>	<u>415,007</u>	<u>2,030</u>	<u>3,404,104</u>	
Aqueous Liquids	1,034,181	117,246	0	1,151,427	1,312
Inorganic Debris	202,860	41,100	1,740	245,700	746
Inorganic Sludge/Particulate	947,641	101,752	0	1,049,393	1,185
Organic Liquids	97,222	20,522	0	117,744	719
Organic Sludge/Particulate	705,163	134,387	290	839,840	857
Hanford Site					
<u>Site Total</u>	<u>4,494,859</u>	<u>697,515</u>	<u>24,070</u>	<u>5,216,444</u>	
Elemental Lead	122,655	20,227	0	142,882	1,000
Heterogeneous Debris	171,560	23,990	3,770	199,320	1,000
Inorganic Debris	5,904	0	870	6,774	955
Inorganic Sludge/Particulate	2,220,314	365,560	0	2,585,874	993
Lab Packs with Metals	486,494	80,144	0	566,638	1,000
Lab Packs without Metals	624,871	103,017	0	727,888	994
Liquid Mercury	13,040	2,176	0	15,216	962
Organic Debris	385,435	63,475	0	448,910	1,000
Organic Sludge/Particulate	347,968	27,136	18,560	393,664	998
Reactive Metals	7,380	0	870	8,250	971
Soils with <50% Debris	109,238	11,790	0	121,028	1,332
Idaho National Engineering Laboratory					
<u>Site Total</u>	<u>13,567,705</u>	<u>835,386</u>	<u>1,305,290</u>	<u>15,708,380</u>	
Aqueous Liquids	112,949	17,257	0	130,206	840
Contaminated Metals	39,582	0	4,060	43,642	960
Elemental Lead	3,739	59	0	3,798	687
Heterogeneous Debris	1,756,918	27,048	223,300	2,007,266	824
Inorganic Debris	779,915	94,992	55,390	930,297	691
Inorganic Sludge/Particulate	3,129,433	392,893	15,370	3,537,696	973
Multiple	6,088,181	112,567	978,170	7,178,918	421
Organic Debris	224	0	4,640	4,864	62
Organic Liquids	19,290	2,851	0	22,141	896
Organic Sludge/Particulate	1,148,527	138,415	1,740	1,288,682	795
Reactive Metals	9,299	0	3,480	12,779	246
Soils	479,649	49,304	19,140	548,093	847

**Table 3.2. Quantities of Contacted-Handled Low-Level Mixed Wastes per Waste Category
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Net Weights (Kg)	Drums (Kg)	Boxes (Kg)	Total Weight (Kg)	Density (Kg/m3)
Lawrence Livermore National Laboratory					
<u>Site Total</u>	<u>166,777</u>	<u>24,462</u>	<u>3,190</u>	<u>194,429</u>	
Aqueous Liquids	21,243	3,557	0	24,800	992
Cemented Solids	34,439	4,263	0	38,702	1,290
Heterogeneous Debris	9,931	0	2,320	12,251	490
Inorganic Debris	5,473	0	870	6,343	555
Inorganic Sludge/Particulate	37,380	5,968	0	43,348	1,099
Lab Packs without Metals	968	441	0	1,409	470
Organic Liquids	53,432	9,644	0	63,076	873
Soils	3,912	588	0	4,500	1,125
Los Alamos National Laboratory					
<u>Site Total</u>	<u>1,063,295</u>	<u>67,532</u>	<u>18,850</u>	<u>1,149,677</u>	
Aqueous Liquids	24,020	3,116	0	27,136	1,080
Heterogeneous Debris	2,590	3,704	0	6,294	100
Inorganic Debris	548,220	470	17,110	565,800	2,550
Lab Packs with Metals	5,400	529	0	5,929	1,500
Liquid Mercury	105,000	1,499	0	106,499	10,000
Organic Debris	5,070	0	1,740	6,810	300
Organic Liquids	92,620	18,140	0	110,760	1,000
Other	271,900	38,455	0	310,355	1,000
Reactive Metals	8,475	1,617	0	10,092	750
Middlesex Sampling Plant					
<u>Site Total</u>	<u>41,805,426</u>	<u>0</u>	<u>2,238,510</u>	<u>44,043,936</u>	
Inorganic Debris	41,805,426	0	2,238,510	44,043,936	1,800
Oak Ridge National Laboratory					
<u>Site Total</u>	<u>267,789</u>	<u>37,013</u>	<u>6,670</u>	<u>311,472</u>	
Aqueous Liquids	37,044	6,115	0	43,159	1,000
Multiple	153,322	28,899	0	182,221	1,056
Organic Liquids	12,001	1,999	0	14,000	1,000
Other	65,422	0	6,670	72,092	1,000
Oak Ridge National Laboratory, K-25 Site					
<u>Site Total</u>	<u>35,645,795</u>	<u>4,263,324</u>	<u>15,660</u>	<u>39,924,779</u>	
Aqueous Liquids	46,799	7,321	0	54,120	1,102
Inorganic Debris	234,674	970	13,630	249,274	2,955
Inorganic Sludge/Particulates	31,561,439	3,744,002	0	35,305,441	1,333
Liquid Mercury	245,785	2,558	0	248,343	13,797
Multiple	1,408,112	170,079	0	1,578,191	1,668
Organic Debris	49,446	8,556	0	58,002	981
Organic Liquids	1,348,525	233,937	0	1,582,462	1,049
Organic Sludge/Particulates	503,479	56,742	0	560,221	1,021
Other	247,535	39,160	2,030	288,725	974
Oak Ridge National Laboratory, Y-12 Plant					
<u>Site Total</u>	<u>17,496,920</u>	<u>1,192,582</u>	<u>432,100</u>	<u>19,121,602</u>	
Aqueous Liquids	13,987	2,323	0	16,309	1,005
Multiple	9,948,247	1,044,582	0	10,992,829	1,294
Organic Liquids	843,425	138,944	0	982,369	1,000
Organic Sludge/Particulates	40,962	6,733	0	47,695	999
Soils	6,650,300	0	432,100	7,082,400	1,500

**Table 3.2. Quantities of Contacted-Handled Low-Level Mixed Wastes per Waste Category
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Net Weights (Kg)	Drums (Kg)	Boxes (Kg)	Total Weight (Kg)	Density (Kg/m3)
Paducah Gaseous Diffusion Plant					
<u>Site Total</u>	<u>203,037</u>	<u>28,518</u>	<u>3,480</u>	<u>235,035</u>	
Aqueous Liquids	5,014	853	0	5,867	1,005
Batteries	1,491	265	0	1,756	1,001
Compressed Gases	1,869	323	0	2,192	996
Heterogeneous Debris	21,462	0	2,320	23,782	1,001
Inorganic Debris	12,741	470	1,160	14,371	1,006
Inorganic Sludge/Particulates	22,320	3,704	0	26,024	1,007
Lab Packs with Metals	25,815	4,263	0	30,078	1,001
Multiple	10,860	1,823	0	12,683	995
Organic Debris	30,641	5,057	0	35,698	1,001
Organic Liquids	36,794	6,086	0	42,880	1,005
Organic Sludge/Particulates	8,650	1,441	0	10,091	999
Other	25,379	4,234	0	29,613	998
Pantex Plant					
<u>Site Total</u>	<u>67,393</u>	<u>6,321</u>	<u>4,060</u>	<u>77,774</u>	
Aqueous Liquids	3,171	529	0	3,700	1,000
Batteries	3,335	265	0	3,600	2,000
Heterogeneous Debris	4,920	0	580	5,500	1,000
Inorganic Sludge/Particulates	11,680	0	1,160	12,840	1,200
Multiple	39,427	4,763	2,320	46,510	850
Organic Liquids	4,860	764	0	5,624	900
Portsmouth Gaseous Diffusion Plant					
<u>Site Total</u>	<u>5,477,489</u>	<u>577,976</u>	<u>271,730</u>	<u>6,327,195</u>	
Aqueous Liquids	56,455	8,056	0	64,511	1,069
Batteries	7,014	500	0	7,514	2,000
Compressed Gases	773	0	870	1,643	100
Heterogeneous Debris	249,858	22,197	120,930	392,985	350
Inorganic Debris	59,342	1,205	13,630	74,177	943
Inorganic Sludge/Particulates	203,940	25,107	0	229,047	1,133
Lab Packs with Metals	22,649	3,498	0	26,147	733
Liquid Mercury	121	29	0	151	13,000
Multiple	1,020	147	0	1,167	1,000
Organic Debris	191,846	1,118	134,850	327,814	240
Organic Liquids	153,326	24,639	0	177,965	930
Organic Sludge/Particulates	9,049	2,058	0	11,107	750
Soils	4,522,095	489,422	1,450	5,012,967	1,400
Puget Sound Naval Shipyard					
<u>Site Total</u>	<u>58,360</u>	<u>5,939</u>	<u>2,030</u>	<u>66,329</u>	
Cemented Solids	49,412	5,380	0	54,792	1,418
Heterogeneous Debris	6,314	0	1,740	8,054	528
Organic Debris	2,635	559	290	3,484	610
Rocky Flats Plant					
<u>Site Total</u>	<u>13,970,130</u>	<u>1,412,462</u>	<u>56,260</u>	<u>15,438,852</u>	
Aqueous Liquids	11,130	1,528	0	12,658	1,050
Beryllium Dust	300	235	0	535	200
Cemented Solids	190,800	706	8,410	199,916	2,000
Elemental Lead	287,100	0	3,190	290,290	9,000
Inorganic Debris	265,440	7,203	44,660	317,303	1,183
Inorganic Sludge/Particulates	13,058,180	1,377,065	0	14,435,245	1,412
Multiple	11,540	2,969	0	14,509	666
Organic Liquids	145,640	22,756	0	168,396	925

**Table 3.2. Quantities of Contacted-Handled Low-Level Mixed Wastes per Waste Category
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Net Weights (Kg)	Drums (Kg)	Boxes (Kg)	Total Weight (Kg)	Density (Kg/m3)
Sandia National Laboratory					
<u>Site Total</u>	<u>1,801</u>	<u>6,115</u>	<u>1,160</u>	<u>9,077</u>	
Other	1,801	6,116	1,160	9,077	40
Savannah River Site					
<u>Site Total</u>	<u>2,851,122</u>	<u>364,471</u>	<u>290,000</u>	<u>3,505,593</u>	
Aqueous Liquids	824,777	136,563	0	961,340	1,040
Elemental Lead	198,605	0	26,390	224,995	759
Inorganic Debris	8,878	0	6,670	15,548	192
Inorganic Sludge/Particulates	1,293,410	171,843	0	1,465,253	1,155
Organic Debris	419,882	37,838	256,940	714,660	309
Organic Liquids	84,952	15,640	0	100,592	961
Soils	20,618	2,587	0	23,205	1,282
Weldon Spring Site					
<u>Site Total</u>	<u>53,936</u>	<u>10,613</u>	<u>0</u>	<u>64,549</u>	
Aqueous Liquids	8,841	1,794	0	10,635	696
Batteries	1,842	617	0	2,459	585
Elemental Lead	1,370	176	0	1,546	1,288
Inorganic Sludge/Particulates	5,749	1,470	0	7,219	795
Lab Packs with Metals	1,568	529	0	2,097	567
Multiple	1,772	294	0	2,066	1,087
Organic Liquids	32,795	5,732	0	38,527	799

* Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg) and the RFP aqueous solar pond waste (45,425 Kg) were excluded.

** Waste Categories were obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Table 3.3. DOE Complex Contacted-Handled Low-Level Mixed Wastes per
Waste Category - Derived for the ITTS Study***

Waste Categories**	Net Weights (Kg)	Drums (Kg)	Boxes (Kg)	Total Weight (Kg)	Density (Kg/m3)
Total CH LLMW	141,560,474	10,055,195	4,677,120	156,292,790	
Aqueous Liquids	2,202,248	306,701	0	2,508,949	1,013
Batteries	13,682	1,646	0	15,329	1,397
Beryllium Dust	300	235	0	535	200
Cemented Solids	274,651	10,349	8,410	293,409	1,570
Compressed Gases	2,642	323	870	3,835	548
Contaminated Metals	39,581	0	4,060	43,642	960
Elemental Lead	731,148	20,462	31,030	782,640	3,252
Heterogeneous Debris	2,226,795	77,587	355,540	2,659,923	635
Inorganic Debris	43,928,872	146,412	2,394,240	46,469,524	1,240
Inorganic Sludge/Particulates	52,580,798	6,203,626	16,530	58,800,954	1,109
Lab Packs with Metals	547,877	89,758	0	637,636	1,001
Lab Packs without Metals	656,299	108,045	0	764,343	849
Liquid Mercury	363,947	6,262	0	370,209	7,722
Multiple	17,663,553	1,366,976	980,490	20,011,019	946
Organic Debris	1,086,298	116,983	398,460	1,601,741	567
Organic Liquids	2,939,802	504,827	0	3,444,629	902
Organic Sludge/Particulate	2,763,797	366,912	20,590	3,151,299	917
Other	612,037	87,965	9,860	709,861	802
Reactive Metals	25,154	1,617	4,350	31,121	656
Soils	12,791,755	626,720	452,690	13,871,165	1,359
Soils with <50% Debris	109,239	11,789	0	121,028	1,332

* Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg) and the RFP aqueous solar pond waste (45,425 Kg) were excluded.

** Waste Categories were obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Table 3.4. Characteristics of Contacted-Handled Low-Level Mixed Wastes
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Total Mass (Kg)	Heating Value (KJ/Kg)***	Total Energy Content (KJ)	Waste Density (Kg/m3)	Moisture Content %	Combustible Matter %	Acid Gas Precursors %
Argonne National Laboratory-East							
Aqueous Liquids	3,079	1,640	5.05E+06	993	75	3	0
Elemental Lead	61,492	126	7.75E+06	11,387	0	1	0
Inorganic Sludge/Particulate	51,702	2,687	1.39E+08	1,096	38	2	0
Lab Packs without Metals	35,046	6,260	2.19E+08	1,082	0	90	0
Organic Debris	1,500	5,150	7.73E+06	600	69	9	1
Organic Liquids	3,501	39,717	1.39E+08	584	0	80	0
Brookhaven National Laboratory							
Elemental Lead	1,638	2,939	4.81E+06	1,092	1	11	0
Inorganic Sludge/Particulate	51,869	1,544	8.01E+07	957	38	3	0
Lab Packs with Metals	6,746	4,493	3.03E+07	1,205	37	16	0
Multiple	1,923	31,165	5.99E+07	321	0	64	0
Organic Liquids	14,594	44,379	6.48E+08	890	3	87	0
Energy Technology Engineering Center							
Elemental Lead	56,000	138	7.73E+06	11,200	0	1	0
Heterogeneous Debris	4,470	31,788	1.42E+08	417	10	27	0
Soils	1,200,000	1,242	1.49E+09	2,000	8	1	4
Fernald Environmental Management Project							
Aqueous Liquids	1,151,427	36,893	4.25E+10	1,312	67	6	0
Inorganic Debris	245,700	113,052	2.78E+10	746	5	17	5
Inorganic Sludge/Particulate	1,049,393	131,929	1.38E+11	1,185	7	7	21
Organic Liquids	117,744	605,136	7.13E+10	719	12	66	12
Organic Sludge/Particulate	839,840	683,947	5.74E+11	857	6	66	6
Hanford Site							
Elemental Lead	142,882	1,551	2.22E+08	1,000	1	3	1
Heterogeneous Debris	199,320	162,320	3.24E+10	1,000	2	47	6
Inorganic Debris	6,774	11,593	7.85E+07	955	2	56	10
Inorganic Sludge/Particulate	2,585,874	21,922	5.67E+10	993	15	21	5
Lab Packs with Metals	566,638	19,161	1.09E+10	1,000	0	89	0
Lab Packs without Metals	727,888	43,661	3.18E+10	994	0	85	0
Liquid Mercury	15,216	5,814	8.85E+07	962	2	20	1
Organic Debris	448,910	27,507	1.23E+10	1,000	3	89	6
Organic Sludge/Particulate	393,664	54,712	2.15E+10	998	5	71	7
Reactive Metals	8,250	1,555	1.28E+07	971	0	6	0
Soils with <50% Debris	121,028	5,030	6.09E+08	1,332	7	2	4
Idaho National Engineering Laboratory							
Aqueous Liquids	130,205	76,284	9.93E+09	840	54	24	3
Contaminated Metals	43,642	1,353	5.90E+07	960	0	6	0
Elemental Lead	3,798	140	5.32E+05	687	0	0	0
Heterogeneous Debris	2,007,266	297,644	5.97E+11	824	1	34	1
Inorganic Debris	930,297	125,366	1.17E+11	691	3	24	0
Inorganic Sludge/Particulate	3,537,696	192,680	6.82E+11	973	13	15	6
Multiple	7,178,918	101,855	7.31E+11	421	1	42	1
Organic Debris	4,864	294,314	1.43E+09	62	3	62	0
Organic Liquids	22,141	189,947	4.21E+09	896	9	79	0
Organic Sludge/Particulate	1,288,682	99,581	1.28E+11	795	2	86	10
Reactive Metals	12,779	4,937	6.31E+07	246	1	16	0
Soils	548,093	3,020	1.66E+09	847	7	7	3
Lawrence Livermore National Laboratory							
Aqueous Liquids	24,800	1,643	4.07E+07	992	75	3	0
Cemented Solids	38,702	1,101	4.26E+07	1,290	39	2	0
Heterogeneous Debris	12,251	21,066	2.58E+08	490	3	67	2
Inorganic Debris	6,343	172,891	1.10E+09	555	2	32	0
Inorganic Sludge/Particulate	43,348	3,338	1.45E+08	1,099	13	2	2
Lab Packs without Metals	1,409	7,814	1.10E+07	470	0	58	0
Organic Liquids	63,076	111,168	7.01E+09	873	7	79	21
Soils	4,500	1,874	8.43E+06	1,125	7	3	3

**Table 3.4. Characteristics of Contacted-Handled Low-Level Mixed Wastes
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Total Mass (Kg)	Heating Value (KJ/Kg)***	Total Energy Content (KJ)	Waste Density (Kg/m3)	Moisture Content %	Combustible Matter %	Acid Gas Precursors %
Los Alamos National Laboratory							
Aqueous Liquids	27,136	18,475	5.01E+08	1,080	70	11	3
Heterogeneous Debris	6,294	96,511	6.07E+08	100	1	43	1
Inorganic Debris	565,800	2,002	1.13E+09	2,550	0	1	0
Lab Packs with Metals	5,929	5,793	3.43E+07	1,500	0	93	0
Liquid Mercury	106,499	1,178	1.25E+08	10,000	13	5	0
Organic Debris	6,810	25,095	1.71E+08	300	5	90	0
Organic Liquids	110,760	117,648	1.30E+10	1,000	0	81	30
Other	310,355	26,821	8.32E+09	1,000	48	33	3
Reactive Metals	10,092	2,243	2.26E+07	750	0	3	30
Middlesex Sampling Plant							
Inorganic Debris	44,043,936	9,670	4.26E+11	1,800	2	32	2
Oak Ridge National Laboratory							
Aqueous Liquids	43,159	1,622	7.00E+07	1,000	75	3	0
Multiple	182,222	112,869	2.06E+10	1,056	12	36	7
Organic Liquids	14,000	38,335	5.37E+08	1,000	0	89	0
Other	72,092	12,565	9.06E+08	1,000	13	39	7
Oak Ridge National Laboratory, K-25 Site							
Aqueous Liquids	54,120	6,244	3.38E+08	1,102	63	2	0
Inorganic Debris	249,274	40,750	1.02E+10	2,955	0	16	0
Inorganic Sludge/Particulates	35,305,441	1,055	3.72E+10	1,333	39	2	0
Liquid Mercury	248,343	93	2.31E+07	13,797	0	0	0
Multiple	1,578,191	104,423	1.65E+11	1,668	32	36	2
Organic Debris	58,002	100,840	5.85E+09	981	5	85	6
Organic Liquids	1,582,462	392,680	6.21E+11	1,049	3	80	26
Organic Sludge/Particulates	560,221	81,454	4.56E+10	1,021	10	65	8
Other	288,725	27,502	7.94E+09	974	8	10	9
Oak Ridge National Laboratory, Y-12 Plant							
Aqueous Liquids	16,309	1,630	2.66E+07	1,005	75	3	0
Multiple	10,992,829	177,524	1.95E+12	1,294	24	31	11
Organic Liquids	982,369	19,424	1.91E+10	1,000	5	67	37
Organic Sludge/Particulates	47,695	35,880	1.71E+09	999	4	89	9
Soils	7,082,400	8,080	5.72E+10	1,500	14	22	4
Paducah Gaseous Diffusion Plant							
Aqueous Liquids	5,867	3,656	2.14E+07	1,005	79	3	0
Batteries	1,756	2,296	4.03E+06	1,001	3	3	1
Compressed Gases	2,192	1,737	3.81E+06	996	33	3	0
Heterogeneous Debris	23,782	9,259	2.20E+08	1,001	9	30	2
Inorganic Debris	14,371	4,999	7.18E+07	1,006	0	5	26
Inorganic Sludge/Particulates	26,024	20,744	5.40E+08	1,007	24	8	1
Lab Packs with Metals	30,078	15,761	4.74E+08	1,001	3	24	3
Multiple	12,683	2,073	2.63E+07	995	25	11	2
Organic Debris	35,698	13,196	4.71E+08	1,001	16	37	3
Organic Liquids	42,880	126,686	5.43E+09	1,005	2	82	18
Organic Sludge/Particulates	10,091	10,459	1.06E+08	999	0	89	72
Other	29,613	22,145	6.56E+08	998	24	35	2
Pantex Plant							
Aqueous Liquids	3,700	1,706	6.31E+06	1,000	76	3	0
Batteries	3,600	1,423	5.12E+06	2,000	4	1	1
Heterogeneous Debris	5,500	26,876	1.48E+08	1,000	3	46	2
Inorganic Sludge/Particulates	12,840	1,310	1.68E+07	1,200	24	5	0
Multiple	46,510	63,752	2.97E+09	850	1	62	16
Organic Liquids	5,624	38,253	2.15E+08	900	0	89	0

**Table 3.4. Characteristics of Contacted-Handled Low-Level Mixed Wastes
Located at Various DOE Sites Derived for the ITTS Study***

Facility & Waste Categories**	Total Mass (Kg)	Heating Value (KJ/Kg)***	Total Energy Content (KJ)	Waste Density (Kg/m3)	Moisture Content %	Combustible Matter %	Acid Gas Precursors %
Portsmouth Gaseous Diffusion Plant							
Aqueous Liquids	64,510	31,817	2.05E+09	1,069	68	11	6
Batteries	7,514	1,351	1.02E+07	2,000	4	1	1
Compressed Gases	1,643	16,773	2.76E+07	100	2	34	0
Heterogeneous Debris	392,986	309,933	1.22E+11	350	5	53	3
Inorganic Debris	74,177	82,704	6.13E+09	943	2	23	1
Inorganic Sludge/Particulates	229,047	38,206	8.75E+09	1,133	30	2	0
Lab Packs with Metals	26,147	7,764	2.03E+08	733	5	3	0
Liquid Mercury	151	2,155	3.25E+05	13,000	0	4	0
Multiple	1,167	15,463	1.80E+07	1,000	19	51	3
Organic Debris	327,814	160,103	5.25E+10	240	3	77	2
Organic Liquids	177,964	382,711	6.81E+10	930	9	78	15
Organic Sludge/Particulates	11,107	115,331	1.28E+09	750	5	61	5
Soils	5,012,967	3,014	1.51E+10	1,400	7	3	4
Puget Sound Naval Shipyard							
Cemented Solids	54,791	2,123	1.16E+08	1,418	7	2	0
Heterogeneous Debris	8,054	87,367	7.04E+08	528	2	70	3
Organic Debris	3,483	47,731	1.66E+08	610	2	67	0
Rocky Flats Plant							
Aqueous Liquids	12,658	3,576	4.53E+07	1,050	81	3	0
Beryllium Dust	535	9,029	4.83E+06	200	0	14	0
Cemented Solids	199,916	10,680	2.14E+09	2,000	4	2	1
Elemental Lead	290,290	147	4.27E+07	9,000	0	1	0
Inorganic Debris	317,303	84,674	2.69E+10	1,183	3	22	1
Inorganic Sludge/Particulates	14,435,245	35,289	5.09E+11	1,412	8	4	1
Multiple	14,509	42,317	6.14E+08	666	16	42	2
Organic Liquids	168,396	102,888	1.73E+10	925	12	75	9
Sandia National Laboratory							
Other	9,075	850,924	7.72E+09	39	2	33	0
Savannah River Site							
Aqueous Liquids	961,340	4,919	4.73E+09	1,039	76	3	0
Elemental Lead	224,995	2,953	6.64E+08	759	1	10	0
Inorganic Debris	15,548	36,027	5.60E+08	192	9	40	0
Inorganic Sludge/Particulates	1,465,253	3,750	5.49E+09	1,155	38	2	0
Organic Debris	714,660	115,149	8.23E+10	309	6	63	2
Organic Liquids	100,592	144,482	1.45E+10	961	1	73	15
Soils	23,205	1,681	3.90E+07	1,282	7	2	4
Weldon Spring Site							
Aqueous Liquids	10,635	10,864	1.16E+08	696	72	4	0
Batteries	2,459	3,699	9.10E+06	585	3	5	1
Elemental Lead	1,546	1,145	1.77E+06	1,288	0	2	0
Inorganic Sludge/Particulates	7,219	8,300	5.99E+07	795	0	4	25
Lab Packs with Metals	2,097	3,614	7.58E+06	567	5	5	0
Multiple	2,066	3,339	6.90E+06	1,087	0	4	52
Organic Liquids	38,527	181,799	7.00E+09	799	3	80	1

* Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg)

and the RFP aqueous solar pond waste (45,425 Kg) were excluded

** Waste Categories were obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

***Conversion formula: (KJ/KG) x 0.42985 = BTU/#

Table 3.5. Elemental Composition of the Contact-Handled Low-Level Mixed Wastes Located at Various DOE Sites Derived for the ITTS Study (continued)*

Facility & Waste Categories**	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Chlorine	Fluorine	Na	Si	Water	Glass Forming Inerts	Bulk Nonoxide Metals	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Tantalum	Vanadium
	Total Weight (Kg)																						
Reactive Metals	919	131	919	2	2					99	1,408					9,299							
Soils	27,692	4,108	7,246	19	214	17,445				35,512	413,476	42,347		12		8	6	9					
Lawrence Livermore National Laboratory (194,425 Kg)																							
Site Total	41,124	6,416	4,218	384	127	7,501				50,618	58,645	23,926	42	21		430	647	108	106	21	21		
Aqueous Liquids	598	128	1,294	378						18,481	3	2,857	42	21		319	425	106	106	21	21		
Cemented Solids	716	120								15,153	19,031	3,423				86	172						
Heterogeneous Debris	4,137	606	2,682	6	12	251				315	4,241												
Inorganic Debris	238	33	231							31	1,720	4,089											
Inorganic Sludge/Particulate	1,049	174	1			164				8,213	28,877	4,792				25	50	2					
Lab Packs without Metals	154	21	1								879	354											
Organic Liquids	34,098	5,313	9		185	6,931				8,125	672	7,743											
Soils	134	21				155				300	3,222	668											
Los Alamos National Laboratory (1,149,684 Kg)																							
Site Total	181,951	28,297	17,275	632	160	47,021		992	1,274	82,014	87,487	267,230	72	51,381		2,476	3,012	294,119	84,190	37	37		
Aqueous Liquids	1,155	181	1,245	344		550				20,191	3	2,503	38	20		289	387	96	96	20	20		
Heterogeneous Debris	1,415	219	634	1	1	54				106	413	3,442						11					
Inorganic Debris	4,595	659	4,518	9	9					488	6,924	203,466		50,400		792		293,940					
Lab Packs with Metals	676	76									4,752	425											
Liquid Mercury	2,429	367	3,377	285	5					13,965	80	1,204	32	16		236	315	79	84,079	16	16		
Organic Debris	2,562	360	2,794	6	6					303	780												
Organic Liquids	41,046	4,682	4,658			26,142					19,666	14,566											
Other	127,801	21,707	49	14	139	18,498				46,961	50,435	40,326	2	945		1,159	2,310	4	4	1	1		
Reactive Metals	272	46				1,777		992	1,274		4,434	1,298											
Middlesex Sampling Plant (44,043,936 Kg)																							
Site Total	7,840,455	1,203,448	5,149,758	8,984	8,503	1,026,238				746,271	8,812,434	8,361,085			753,167			8,361,085					1,772,508
Inorganic Debris	7,840,455	1,203,448	5,149,758	8,984	8,503	1,026,238				746,271	8,812,434	8,361,085			753,167			8,361,085					1,772,508
Oak Ridge National Laboratory (311,475 Kg)																							
Site Total	65,254	8,736	19,932	1,207	241	20,017		1,772	2,275	69,506	68,396	34,624	135	72	216	1,041	1,375	13,802	2,732	67	67		
Aqueous Liquids	1,027	220	2,257	659						32,228	5	4,911	74	37		556	741	185	185	37	37		
Multiple	38,123	5,029	7,790	357	183	17,274		240	308	27,896	44,984	24,837	41	26	216	338	438	13,568	535	20	20		
Organic Liquids	9,954	1,114	1,325								2	1,605											
Other	16,150	2,373	8,567	191	58	2,743		1,532	1,967	9,382	23,405	3,271	20	10		147	196	49	2,012	10	10		
Oak Ridge National Laboratory, K-25 Site (39,924,774 Kg)																							
Site Total	2,188,392	345,149	194,769	5,264	7,574	270,865	66	2,498	3,208	14,600,961	18,152,750	3,600,595	548	3,809		87,821	172,775	40,036	247,147	272	275		
Aqueous Liquids	1,349	254	1,724	504		168				37,374	5,387	5,878	58	29		446	604	144	144	29	29		
Inorganic Debris	11,657	1,588	5,428	16	61	1,453				3,184	61,426	131,968						32,493					
Inorganic Sludge/Particulates	629,029	105,589								13,887,033	17,440,645	3,006,433				78,904	157,807						
Liquid Mercury	430	72									2	2,054							245,785				
Multiple	369,772	61,526	21,677	4,341	433	49,873				548,528	328,233	168,360	487	2,658		7,272	12,111	1,217	1,217	243	243		
Organic Debris	25,336	3,714	14,212	31	64	3,443	66			2,463	1,801	6,870											
Organic Liquids	917,640	140,365	13,284	69	3,946	130,280				76,639	99,637	196,543		869		877	1,754	559					
Organic Sludge/Particulates	205,537	30,162	132,096	298	293	72,558				29,461	39,257	50,103		68		129	258						
Other	27,642	1,879	6,348	5	2,777	13,090		2,498	3,208	16,279	176,362	32,386	3	185		193	241	5,623	1		3		
Oak Ridge National Laboratory, Y-12 Plant (19,121,597 Kg)																							
Site Total	2,994,017	490,634	175,362	10,031	4,077	1,321,282	150	4,084	5,243	3,090,148	8,786,805	1,153,308	1,101	19,272	165	37,116	68,402	125,017	828,445	550	550		5,831
Aqueous Liquids	390	83	852	249						12,169	2	1,865	28	14		210	280	70	70	14	14		
Multiple	1,810,277	301,869	43,426	9,322	2,810	445,854	150	4,084	5,243	2,070,983	4,298,785	958,123	1,048	12,391	165	26,539	47,512	124,885	828,313	524	524		
Organic Liquids	149,410	17,798	17,003	222	29	574,835				18,697	78,558	119,363	25	12		187	249	62	62	12	12		5,831
Organic Sludge/Particulates	27,438	4,661			30	4,010				2,048	1,234	7,454		205		205	410						
Soils	1,006,502	166,223	114,088	238	1,208	296,583				986,251	4,408,226	66,503		6,650		9,975	19,951						

Table 3.5. Elemental Composition of the Contact-Handled Low-Level Mixed Wastes Located at Various DOE Sites Derived for the ITTS Study (continued)*

Facility & Waste Categories**	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Chlorine	Fluorine	NO	SO ₂	Water	Glass Forming Inerts	Pulverized Solids	Aluminum	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Tantalum	Uranium
Total Weight (Kg)																							
Paducah Gaseous Diffusion Plant (235,038 Kg)																							
Site Total	56,368	8,413	10,300	151	312	16,903		64	82	31,551	67,604	38,285	32	222	81	602	596	1,421	81	16	16		1,791
Aqueous Liquids	180	29	97	28		28				4,740	1	685	3	2		24	32	8	8	2	2		
Batteries	59	11	38		19					60		224				3		1,342					
Compressed Gases	62	10				6				732		1,381											
Heterogeneous Debris	3,873	587	2,364	5	5	484				2,110	10,430	2,146	13	6		97	129	32	32	6	6		1,456
Inorganic Debris	457	69	306	1	1	1,782				34	1,571	10,150				39	74	5					
Inorganic Sludge/Particulates	2,170	271	239		95	261				6,315	13,068	3,335				39	77	26					145
Lab Packs with Metals	7,753	1,253	1,197	6	9	829				950	12,800	5,101				39	77	26					
Multiple	436	66	23	7		114		64	82	3,133	7,097	1,464	6	3		61	90	16	16	3	3		
Organic Debris	7,898	1,189	2,821	7	27	944				5,667	13,004	4,061				27	54	17					
Organic Liquids	26,361	3,972	435	2	127	4,474				926	1,680	4,887						17					
Organic Sludge/Particulates	1,535	178				7,220					1	1,157											
Other	5,584	798	2,780	95	29	761				6,884	7,952	3,694	10	236	81	319	140	25	25	5	5		190
Pantex Plant (77,776 Kg)																							
Site Total	20,588	2,474	5,787	58	72	9,414				6,931	12,032	12,804	6	3		21	27	2,305	121	3	3		
Aqueous Liquids	96	19	155	45		5				2,828		425	5	3		38	51	13	13	3	3		
Batteries	76	15	85		42					133		239				7		3,002					
Heterogeneous Debris	1,310	189	835	2	5	81				183	1,522	738				4	5	518	107				
Inorganic Sludge/Particulates	306	44	306	1	1					3,117	4,341	4,672				18	35						
Multiple	14,777	1,757	3,869	10	24	9,328				670	6,175	6,116	1			4	6	3,772	1				
Organic Liquids	4,023	450	537								1	614											
Portsmouth Gaseous Diffusion Plant (6,327,198 Kg)																							
Site Total	487,386	71,621	124,508	1,076	1,481	245,601		34	44	532,982	4,308,506	522,312	166	118		1,658	2,454	2,154	1,448	84	84		16,474
Aqueous Liquids	5,229	692	771	226	4	16,045				31,980	2,439	6,469	25	13		190	255	86	63	13	13		
Batteries	151	31	178		89					281		457				14	1	6,312					
Compressed Gases	258	37	230			5				25	352	735											
Heterogeneous Debris	78,284	10,959	50,648	106	294	10,871		34	44	24,744	176,270	38,851	73	42		560	754	183	193	37	37		
Inorganic Debris	5,258	774	3,897	8	12	307				1,439	22,633	36,579						2,370	900				
Inorganic Sludge/Particulates	9,778	1,386	4,789	334	7	20				85,424	88,307	20,537	38	19		634	1,079	94	94	19	19		
Lab Packs with Metals	827	149	478	139						1,359	19,934	2,809	18	9		136	181	45	45	9	9		
Liquid Mercury	5	1										24						121					
Multiple	321	43	117	2		31				225	197	220				3	4	1	1				
Organic Debris	150,585	22,310	58,682	147	650	12,845				7,744	73,954	897											
Organic Liquids	106,508	15,307	4,325	109	420	16,344				13,986	876	19,784	12	6		92	122	31	31	6	6		
Organic Sludge/Particulates	4,220	713	10	4	4	571				581	2,910	1,944				29	58	32					
Soils	125,962	19,219	383	1	1	188,562				365,201	3,920,634	393,006											
Puget Sound Naval Shipyard (66,331 Kg)																							
Site Total	5,540	727	2,512	6	12	257				3,283	46,493	5,808				376	247	252	41				
Cemented Solids	904	152								3,706	45,339	4,320				124	247						
Heterogeneous Debris	3,215	478	1,583	4	10	257				181	859	963				252		252					
Organic Debris	1,421	167	936	2	2					96	295	525							41				
Rocky Flats Plant (15,438,864 Kg)																							
Site Total	1,737,259	221,278	72,075	526	2,352	232,174		47	60	879,533	10,201,658	1,343,422	42	2,658	27	31,990	63,730	369,442	121	25	25	28	189,345
Aqueous Liquids	422	82	596	174	1					9,665	4	1,228				147	196	49	49	10	10		
Beryllium Dust	52	8	187							2	1	189											
Cemented Solids	4,025	624	2,221	5	6	257				7,668	93,740	91,287		12		24	48						
Elemental Lead	842	120	842	2	2					91	1,291							287,100					
Inorganic Debris	60,386	8,534	38,677	138	114	16,773				11,673	71,359	27,183	6	3		46	62	82,230	15	3	3	98	
Inorganic Sludge/Particulates	1,582,117	268,230	34,282	1,685		206,059				835,945	10,010,455	1,202,768				31,584	63,161	6					189,345
Multiple	3,061	483	1,206	13	4	304		47	60	2,323	4,425	2,494	1	12		26	45	3	3	1	1		
Organic Liquids	86,354	13,197	1,064	194	440	15,781				12,166	20,383	18,273	22	11		163	218	54	54	11	11		

Table 3.5. Elemental Composition of the Contact-Handled Low-Level Mixed Wastes Located at Various DOE Sites Derived for the ITTS Study (continued)*

Facility & Waste Categories**	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Chlorine	Fluorine	NO	SO ₂	Water	Glass Forming Inerts	Bulk Nontoxic Metals	Aluminum	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Tantalum	Titanium
Total Weight (Kg)																							
Sandia National Laboratory (9,076 Kg)																							
Site Total	1,891	293	769	2	2	31				156	537	5,330						57					8
Other	1,891	293	769	2	2	31				156	537	5,330						57					8
Savannah River Site (3,505,593)																							
Site Total	425,733	63,195	217,051	7,147	514	7,881				1,174,867	897,276	304,995	757	379		2,137	14,171	179,800	1,932	379	379		
Aqueous Liquids	26,911	4,696	23,073	6,757		2,993				768,172	146	109,660				5,680	7,573	1,893	1,893	379	379		
Elemental Lead	11,440	1,733	7,236	16	142	809				1,179	14,659	10,009				20	1	177,751					
Inorganic Debris	4,152	296	2,087	4	4	14				1,921	4,423	2,314				138		156	39				
Inorganic Sludge/Particulates	28,871	4,846								569,100	714,744	137,990				3,234	6,467						
Organic Debris	289,922	44,229	176,651	370	353	1,009				32,175	139,371	30,384				65	130						
Organic Liquids	63,805	7,298	8,004		15	2,196				655	6,060	12,560											
Soils	632	97				860				1,665	17,873	2,078											
Weldon Spring Site (64,546 Kg)																							
Site Total	27,970	3,196	3,649	15	24	2,365		733	826	8,961	5,167	8,546	2	2		18	21	3,045	4	1	1		
Aqueous Liquids	394	59	18	5		70				8,633	1	1,440	1			4	6	1	1				
Batteries	121	22	47		23					74		510						1,657					
Elemental Lead	30	5										142				4		1,370					
Inorganic Sludge/Particulates	247	41				1,152		733	826		3,039	1,180											
Lab Packs with Metals	105	18	33	10						94	1,380	425	1	1		9	13	3	3	1	1		
Multiple	59	10				1,080				1	679	237											
Organic Liquids	27,014	3,041	3,551		1	63				159	68	4,612				1	2	14					

* Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg) and the RFP aqueous solar pond waste (45,425 Kg) were excluded.

** Waste Categories were obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

Table 3.6. Elemental Composition of the DOE Complex Contact-Handled Low-Level Mixed Wastes Derived for the ITTS Study*

Facility & Waste Categories**	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Chlorine	Fluorine	NO	SO ₂	Water	Glass Packaging Inerts	High Melting Metals	Arsenic	Boron	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Tantalum	Vanadium
Total Weight (Kg)																							
TOTAL	20,373,728	3,192,874	2,259,403	63,671	63,633	3,870,540	6,296	27,278	47,075	24,624,652	59,846,785	20,967,458	9,094	98,748	753,772	244,823	422,110	10,773,126	1,190,332	4,545	4,549	23,101	2,415,249
Aqueous Liquids	62,783	12,035	99,896	29,157	10	20,573				1,947,487	8,589	246,378	3,277	1,648		24,605	32,825	8,216	8,193	1,639	1,639		
Batteries	407	79	347		174					547	1	1,430				27	1	12,314					
Beryllium Dust	52	8	187							2	1	189			97								
Cemented Solids	5,645	896	2,221	5	6	257				26,527	158,110	99,030		12		234	467						
Compressed Gases	320	47	230			11				757	353	2,115											
Contaminated Metals	1,072	153	1,072	2	2					116	1,643	39,582											
Elemental Lead	16,281	2,508	8,461	19	144	1,577				2,803	32,558	28,131				20	1	690,138					
Heterogeneous Debris	271,862	39,748	215,539	697	30,720	30,287		34	44	92,551	556,807	462,443	128	70		1,225	1,304	953,998	702	64	64		1,456
Inorganic Debris	8,001,098	1,225,936	5,232,752	9,239	9,242	1,065,107	54	557	44	857,073	9,823,362	8,889,097	13	50,438	753,167	1,042	138	8,777,533	1,014	6	7	98	1,772,508
Inorganic Sludge/Particulate	2,701,353	451,293	133,790	5,917	2,817	391,845	1,918	27,180	34,780	16,877,605	32,011,725	5,096,715	3,877	12,715		150,158	280,882	10,142	9,934	1,938	1,939		592,432
Lab Packs with Metals	76,221	9,341	2,313	212	9	829				4,867	468,367	74,647	26	52		233	337	91	65	13	13		
Lab Packs without Metals	88,935	10,420	114	33						321	577,654	86,760	4	2		32	43	11	11	2	2		
Liquid Mercury	4,339	664	3,985	287	6	195				14,196	2,958	5,029	33	16		246	328	82	337,813	16	16		
Multiple	4,017,906	641,448	845,690	15,793	7,559	621,344	4,027	4,485	5,759	2,761,165	5,455,884	4,348,352	1,637	15,121	382	34,655	60,767	314,047	830,358	819	819	23,003	
Organic Debris	691,359	101,946	370,282	811	1,337	44,808	66			61,581	235,222	94,013				92	184		41				
Organic Liquids	1,534,365	222,394	55,755	617	5,414	824,840				138,852	228,818	422,041	61	918		1,356	2,406	746	153	31	31		5,831
Organic Sludge/Particulate	1,530,352	252,854	145,390	315	1,762	277,307	50			270,615	195,038	395,641	3	9,718		9,798	19,583	40	6	1	1		42,825
Other	179,067	27,050	18,513	307	3,006	35,123		4,030	5,174	79,662	258,691	85,008	35	1,376	81	1,818	2,887	5,759	2,042	16	18		197
Reactive Metals	1,420	210	1,149	2	2	1,777		992	1,274	124	6,194	8,679				9,299							
Soils	1,185,863	193,382	121,717	258	1,423	550,105				1,478,980	9,730,115	572,711		6,662		9,983	19,957	9					
Soils with <50% Debris	3,028	462				4,555				8,821	94,695	9,467											

* Quantities obtained from the DOE/NBM-1100 (MWIR Report), April 1993. The Hanford tank waste (40,086 Kg) and the RFP aqueous solar pond waste (45,425 Kg) were excluded.

** Waste Categories were obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

Table 3.7. Elemental Composition for Each Physical Matrix for the DOE Complex

[illegible]

Figure 3.1. Physical Matrix Distribution for DOE Complex Derived for the ITTS Study*

* Does not include mass of containers.

Physical Matrices not included: Ta, Flooring Mat., Ceramics, Cemented Org, Bulk Cd, Asphalt, TFE, Graphite due to amounts < 30,000 kg.

Information obtained from the DOE/NBM-1100 Apr. 1993.

Figure 3.2. Physical Matrix Distribution for DOE Complex - Derived for the ITTS Study*

* Does not include mass due to containers.
 "Other" consists of the remaining physical matrices.
 Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

Figure 3.3. Waste Distribution for the DOE Complex Including Containers Derived for the ITTS Study

"Other" consists of ANL-E, BNL, LLNL, LANL, ORNL, SNL, PGDP, PXP, PSNS, ETEC, and WSS.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

Figure 3.4. Waste Distribution for the DOE Complex Excluding Containers Derived for the ITTS Study

"Other" consists of ANL-E, BNL, LLLNL, LANL, ORNL, SNL, PGDP, PXP, PSNS, ETEC, and WSS.
 Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.5. Combustible vs Noncombustible
for DOE Complex Including Containers
Derived for the ITTS Study
(TOTAL=156,292,790 Kg)**

■ Combustible ■ Noncombustible

Information obtained from the DOE/NBM-1100 (MWIR), April 1993.

Combustible portion of DOE wastes (w/o containers) = 28,303,176 Kg

Combustible portion of drums: 10,055,195 x 19.7% (PE liner) = 1,980,873 Kg; boxes: 4,677,120 x 60% = 2,806,272 Kg

**Figure 3.6. Combustible vs Noncombustible
for DOE Complex Excluding Containers
Derived for the ITTS Study
(TOTAL=141,560,474 Kg)**

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.
Combustible portion of DOE wastes (w/o containers) = 28,303,176 Kg.

**Figure 3.7. Combustible Physical Matrix
Distribution for the DOE Complex
Derived for the ITTS Study
(Combustibles=28,303,176 Kg)***

* Does not include mass due to containers.

"Other" consists of Wood Products, Rubber, Non-halogenated Org. Liquids, Cloth, and Graphite.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.8. Noncombustible Physical Matrix Distribution for
the DOE Complex
Derived for the ITTS Study
(Noncombustibles=113,257,298 Kg)***

"Other" consists of Sheetrock, Salts, Resins, Paint Residues, Metal Finings, Leaded Rubber, Inorganic Labpacks, Concrete, Bulk Mercury and Barium, Absorbed Inorganics, Beryllium, Batteries, and Asbestos.

"Aqueous Liquids" consists of Aqueous TC Metals, Aqueous Cyanide, and Aqueous Organics.

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.9. Physical Matrix Distribution for
Argonne National Laboratory--East
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.10. Combustible vs Noncombustible
for Argonne National Laboratory--East
Derived for the ITTS Study
(TOTAL=142,892 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.11. Combustible Physical Matrix
Distribution for Argonne National Laboratory--East
Derived for the ITTS Study
(Combustibles=33,164 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.12. Noncombustible Physical Matrix
Distribution for
Agronne National Laboratory--East
Derived for the ITTS Study
(Noncombustibles=109,728 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.13. Radiological Distribution
for Argonne National Laboratory--East
Derived for the ITTS Study**

**Figure 3.14. Physical Matrix Distribution
for Brookhaven National Laboratory
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.15. Combustible vs Noncombustible
for Brookhaven National Laboratory
Derived for the ITTS Study
(TOTAL=64,837 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.16. Combustible Physical Matrix
Distribution for Brookhaven
National Laboratory
Derived for the ITTS Study
(Combustibles=14,235 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.17. Noncombustible Physical Matrix
Distribution for Brookhaven
National Laboratory
Derived for the ITTS Study
(Noncombustibles=50,602 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.18. Radiological Distribution for
Brookhaven National Laboratory
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.19. Physical Matrix Distribution
for Energy Technology Engineering Center
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.20. Combustible vs Noncombustible
for Energy Technology Engineering Center
Derived for the ITTS Study
(TOTAL=1,173,844 Kg)***

* Does not include mass due to containers.
There are only 196 kg of combustibles (graphite and paper)
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.21. Noncombustible Physical Matrix
Distribution for Energy Technology
Engineering Center
Derived for the ITTS Study
(Noncombustibles=1,173,648 Kg)***

* Does not include mass due to containers.
"Other" consists of Paint Residue, Misc. Glass, Bulk Metal, and Aqueous Organics.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.22. Radiological Distribution
for Energy Technology Engineering Center
Derived for the ITTS Study**

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.23. Physical Matrix Distribution
for Fernald Environmental Management Project
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.24. Combustible vs Noncombustible
for Fernald Environmental Management Project
Derived for the ITTS Study
(TOTAL=2,987,064 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.25. Combustible Physical Matrix
Distribution for Fernald Environmental
Management Project
Derived for the ITTS Study
(Combustibles=544,217 Kg)***

■ Organic Sludge □ Oil ■ Other

* Does not include mass due to containers.

"Other" consists of Plastic, Cloth, and Wood Products.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.26. Noncombustible Physical Matrix
Distribution for Fernald Environmental
Management Project
Derived for the ITTS Study
(Noncombustibles=2,442,846 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.27. Radiological Distribution
for Fernald Environmental Management Project
Derived for the ITTS Study**

**Figure 3.28. Physical Matrix Distribution
for Hanford Site
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-110 (MWIR Report), April 1993.

**Figure 3.29. Combustible vs Noncombustible
for Hanford Site
Derived for the ITTS Study
(TOTAL=4,494,859 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-110 (MWIR Report), April 1993.

**Figure 3.30. Combustible Physical Matrix
Distribution for Hanford Site
Derived for the ITTS Study
(Combustibles=1,829,737 Kg)***

* Does not include mass due to containers.

"Other" consists of Oil, Halogenated Org. Liquid, Cardboard, Rubber, and Wood.

Information obtained from the DOE/NBM-110 (MWIR Report), April 1993.

**Figure 3.31. Noncombustible Physical Matrix
for Hanford Site
Derived for the ITTS Study
(Noncombustibles=2,665,123 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-110 (MWIR Report), April 1993.

**Figure 3.32. Radiological Distribution for
Hanford Site
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.33. Physical Matrix Distribution
for Idaho National Engineering Laboratory
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the WM-PD-92-009, September 1992 and EGG-WM-10909, August 1993.

**Figure 3.34. Combustible vs Noncombustible
for Idaho National Engineering Laboratory
Derived for the ITTS Study
(TOTAL=13,567,705 Kg)***

* Does not include mass due to containers.
Information obtained from the WM-PD-92-009 and EGG-WM-10909, August 1993.

**Figure 3.35. Combustible Physical Matrix
Distribution for Idaho
National Engineering Laboratory
Derived for the ITTS Study
(Combustibles=4,190,213 Kg)***

* Does not include mass due to containers.

"Other" consists of Oil, Non-halogenated Org. Liquids, Halogenated Org. Liquids, and Graphite.

Information obtained from the WM-PD-92-009, September 1992 and EGG-WM-10909, August 1993.

**Figure 3.36. Noncombustible Physical Matrix
Distribution for Idaho National Engineering
Laboratory
Derived for the ITTS Study
(Noncombustibles=9,377,493 Kg)***

"Other" consists of Paint Residues, Resins, Cemented Resins, Uranium Compounds Bulk Mercury and Cadmium, Asphalt, Salts, Incinerator Ash, Ceramics, Leaded Rubber, Tantalum, Asbestos, Aqueous Organics, Absorbed Inorganics, Firebrick, and Glass Rings.

* Does not include mass due to containers.

Information obtained from the WM-PD-92-009 September 1992 and EGG-WM-10909, August 1993.

**Figure 3.37. Radiological Distribution for Idaho
National Engineering Laboratory
Derived for the ITTS Study**

**Figure 3.38. Physical Matrix Distribution
for Lawrence Livermore National Laboratory
Derived for the ITTS Study***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.39. Combustible vs Noncombustible
for Lawrence Livermore National Laboratory
Derived for the ITTS Study
(TOTAL=166,778 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.40. Combustible Physical Matrix
Distribution for Lawrence
Livermore National Laboratory
Derived for the ITTS Study
(Combustibles=53,783 Kg)***

* Does not include mass due to containers.

"Other" consists of Non-halogenated Org. Liquids, Graphite, Cloth, Rubber, and Organic Labpacks.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.41. Noncombustible Physical Matrix
Distribution for Lawrence
Livermore National Laboratory
Derived for the ITTS Study
(Noncombustibles=112,995 Kg)***

* Does not include mass due to containers.

"Other" consists of Non-halogenated Org. Liquids, Graphite, Cloth, Rubber, and Organic Labpacks.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.42. Radiological Distribution for
Lawrence Livermore National Laboratory
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.43. Physical Matrix Distribution
for Los Alamos National Laboratory
Derived for the ITTS Study***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.44. Combustible vs Noncombustible
for Los Alamos National Laboratory
Derived for the ITTS Study
(TOTAL=1,063,295 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.45. Combustible Physical Matrix
Distribution for Los Alamos National
Laboratory
Derived for the ITTS Study
(Combustibles=280,336 Kg)***

Organic Sludge
 Non-halogenated Org. Liquids
 Halogenated Org. Liquids

Cloth
 Other

* Does not include mass due to containers.

"Other" consists of Wood Products, Plastic, and Organic Labpacks.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.46. Noncombustible Physical Matrix
Distribution for Los Alamos National Laboratory
Derived for the ITTS Study
(Noncombustibles=782,960 Kg)***

* Does not include mass due to containers.

"Other" consists of Aqueous Organics, Aqueous Cyanide, Soil/Dirt, and Bulk Cadmium.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.47. Radiological Distribution
for Los Alamos National Laboratory
Derived for the ITTS Study**

**Figure 3.48. Physical Matrix Distribution for
Middlesex Sampling Plant
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.49. Combustible vs Noncombustible
for Middlesex Sampling Plant
Derived for the ITTS Study
(TOTAL=41,805,426 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.50. Combustible Physical Matrix
Distribution for Middlesex Sampling Plant
Derived for the ITTS Study
(Combustibles=12,541,628 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.51. Noncombustible Physical Matrix
Distribution for Middlesex Sampling Plant
Derived for the ITTS Study
(Noncombustible=29,263,798 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.52. Radiological Distribution for
Middlesex Sampling Plant
Derived for the ITTS Study**

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.53. Physical Matrix Distribution
for Oak Ridge National Laboratory
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.54. Combustible vs Noncombustible
for Oak Ridge National Laboratory
Derived for the ITTS Study
(TOTAL=267,789 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.55. Combustible Physical Matrix
Distribution for Oak Ridge National Laboratory
Derived for the ITTS Study
(Combustibles=106,171 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.56. Noncombustible Physical Matrix
Distribution for Oak Ridge National Laboratory
Derived for the ITTS Study
(Noncombustibles=161,618 Kg)***

* Does not include mass due to containers.

"Other" consists of Bulk Mercury, Beryllium, Inorganic Sludge, and Ceramics.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.57. Radiological Distribution
for Oak Ridge National Laboratory
Derived for the ITTS Study**

**Figure 3.58. Physical Matrix Distribution
for Oak Ridge National Laboratory, K-25 Site
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100, April 1993.

**Figure 3.59. Combustible vs Noncombustible
for Oak Ridge National Laboratory, K-25 Site
Derived for the ITTS Study
(TOTAL=35,645,796 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100, April 1993.

**Figure 3.60. Combustible Physical Matrix
Distribution for Oak Ridge National
Laboratory, K-25 Site
Derived for the ITTS Study
(Combustibles=2,274,963 Kg)***

* Does not include mass due to containers.

"Other" consists of Rubber, Cardboard, and Absorbed Organics.

Information obtained from the DOE/NBM-1100, April 1993.

**Figure 3.61. Noncombustible Physical Matrix
Distribution for Oak Ridge National
Laboratory, K-25 Site
Derived for the ITTS Study
(Noncombustibles=33,370,832 Kg)***

■ Inorganic Sludge ■ Other

"Other" consists of Soil, Salt, Resin, Paint Residue, Misc. Glass, Metal Fines & Turnings, Leaded Rubber, Lead Shielding, Incinerator Ash, Flooring Material, Concrete, Ceramics, Bulk Mercury and Metals, Asphalt, Aqueous TC Metals, Organics, and Cyanide.

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100, April 1993.

**Figure 3.62. Radiological Distribution
for Oak Ridge National Laboratory, K-25 Site
Derived for the ITTS Study**

Information obtained from DOE/RW-0006-Rev. 8, October 1992 and EPA-520/1-91-010-2, May 1991.

**Figure 3.63. Physical Matrix Distribution for
Oak Ridge National Laboratory, Y-12 Plant
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.64. Combustible vs Noncombustible
for Oak Ridge National Laboratory, Y-12 Plant
Derived for the ITTS Study
(TOTAL=17,496,920 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.65. Combustible Physical Distribution
for Oak Ridge National Laboratory, Y-12 Plant
Derived for the ITTS Study
(Combustibles=4,673,555 Kg)***

* Does not include mass due to containers.

"Other" consists of Cloth, Paper, Plastics, Organic Labpacks, and Cardboard.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.66. Noncombustible Physical Matrix
Distribution for Oak Ridge
National Laboratory, Y-12 Plant
Derived for the ITTS Study
(Noncombustibles=12,823,365 Kg)***

* Does not include mass due to containers.

"Other" consists of Salts, Glass, Beryllium, Pb Shielding, Aqueous Org, Bulk Metal, Batteries, Inorg. Labpacks, Uranium Compounds.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.67. Radiological Distribution for Oak Ridge National Laboratory, Y-12 Plant
Derived for the ITTS Study**

**Figure 3.68. Physical Matrix Distribution
for Paducah Gaseous Diffusion Plant
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.69. Combustible vs Noncombustible
for Paducah Gaseous Diffusion Plant
Derived for the ITTS Study
(TOTAL=203,037 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

Figure 3.70. Combustible Physical Matrix Distribution for Paducah Gaseous Diffusion Plant Derived for the ITTS Study (Combustibles=80,127 Kg)*

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.71. Noncombustible Physical Matrix
Distribution for Paducah Gaseous Diffusion Plant
Derived for the ITTS Study
(Noncombustibles=122,910 Kg)***

* Does not include mass due to containers.

"Other" consists of Salts, Inorganic Labpacks, Bulk Cadmium and Barium, Beryllium, and Batteries.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.72. Radiological Distribution
for Paducah Gaseous Diffusion Plant
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.73. Physical Matrix Distribution for
Pantex Plant
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.74. Combustible vs Noncombustible
for Pantex Plant
Derived for the ITTS Study
(TOTAL=67,393 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.75. Combustible Physical Matrix
Distribution for Pantex Plant
Derived for the ITTS Study
(Combustibles=35,513 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.76. Noncombustible Physical Matrix
Distribution for Pantex Plant
Derived for the ITTS Study
(Noncombustibles=31,880 Kg)***

* Does not include mass due to containers.

"Other" Category consists of Leaded Rubber, Absorbed Inorganics, Bulk Mercury, and Ceramics.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.77. Radiological Distribution for
Pantex Plant
Derived for the ITTS Study**

**Figure 3.78. Physical Matrix Distribution for
Portsmouth Gaseous Diffusion Plant
Derived for the ITTS Study**

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.79. Combustible vs Noncombustible
for Portsmouth Gaseous Diffusion Plant
Derived for the ITTS Study
(TOTAL=5,477,490 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.80. Combustible Physical Matrix
Distribution for Portsmouth
Gaseous Diffusion Plant
Derived for the ITTS Study
(Combustibles=465,855 Kg)***

* Does not include mass due to containers.

"Other" consists of Cardboard, Graphite, Organic Sludge, and PE/PP.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.81. Noncombustible Physical Matrix
Distribution for Portsmouth
Gaseous Diffusion Plant
Derived for the ITTS Study
(Noncombustibles=5,011,635 Kg)***

Bulk (nontoxic) Metals
 Inorganic Sludge
 Soil/Dirt
 Other

"Other" consists of Glass, Uranium Compounds, Salts, Resins, Paint Residues, Metal Fines & Turnings, Lead Shielding, Inorg Sludge, Inorg Labpacks, Incinerator Ash, Diatomaceous Earth, Concrete, Bulk Mercury, Batteries, Aqueous TC Metal Aqueous Org., Aqueous Cyanide, Absorbed Inorg.

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.82. Radiological Distribution for
Portsmouth Gaseous Diffusion Plant
Derived for the ITTS Study**

Information obtained from the DOE/RW-006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.83. Physical Distribution Matrix
for Puget Sound Naval Shipyard
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.84. Combustible vs Noncombustible
for Puget Sound Naval Shipyard
Derived for the ITTS Study
(TOTAL=58,360 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.85. Combustible Physical Matrix
Distribution for Puget Sound Naval Shipyard
Derived for the ITTS Study
(Combustibles=7,213 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.86. Noncombustible Physical Matrix
Distribution for Puget Sound Naval Shipyard
Derived for the ITTS Study
(Noncombustibles=51,146 Kg)***

■ Bulk (nontoxic) Metals ▨ Cemented Inorganic Sludge □ Other

* Does not include mass due to containers.

"Other" Category consists of Bulk Cadmium, Bulk Mercury, Miscellaneous Glass, and Lead Shielding.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.87. Radiological Distribution for Puget
Sound Naval Shipyard
Derived for the ITTS Study**

**Figure 3.88. Physical Matrix Distribution for
Rocky Flats Plant
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.89. Combustible vs Noncombustible
for Rocky Flats Plant
Derived for the ITTS Study
(TOTAL=13,970,130 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.90. Combustible Physical Matrix
Distribution for Rocky Flats Plant
Derived for the ITTS Study
(Combustibles=240,151 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.91. Noncombustible Physical Matrix
Distribution for Rocky Flats Plant
Derived for the ITTS Study
(Noncombustibles=13,729,979 Kg)***

Cemented Inorganic Sludge	Cemented Organic Sludge	Lead Shielding
Other	Diatomaceous Earth	Uranium Compounds

"Other" consists of Incinerator Ash, Salts, Resins, Metal Fines, Leaded Rubber, Raschig Rings, Asbestos, Ceramics, Tantalum, Soil, Misc. Glass, Inorganic Sludge, Bulk Metal, Beryllium, Asphalt, Aqueous TC Metals, Organics, and Cyanide.

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.92. Radiological Distribution for
Rocky Flats Plant
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

Figure 3.93. Physical Matrix Distribution for Sandia National Laboratory Derived for the ITTS Study*

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.94. Combustible vs Noncombustible
for Sandia National Laboratory
Derived for the ITTS Study
(TOTAL=1,801)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.95. Combustible Physical Matrix
Distribution for Sandia National Laboratory
Derived for the ITTS Study
(Combustibles=1,198 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.96. Noncombustible Physical Matrix
Distribution for Sandia National Laboratory
Derived for the ITTS Study
(Noncombustibles=603 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.97. Radiological Distribution for
Sandia National Laboratory
Derived for the ITTS Study**

**Figure 3.98. Physical Matrix Distribution for
Savannah River Site
Derived for the ITTS Study***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.99. Combustible vs Noncombustible
for Savannah River Site
Derived for the ITTS Study
(TOTAL=2,851,122 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.100. Combustible Physical Matrix
Distribution for Savannah River Site
Derived for the ITTS Study
(Combustibles=461,098 Kg)***

* Does not include mass due to containers.

"Other" consists of Graphite and Halogenated Organic Liquids.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.101. Noncombustible Physical Matrix
Distribution for Savannah River Site
Derived for the ITTS Study
(Noncombustibles=2,390,024 Kg)***

■ Aqueous Cyanide ▨ Aqueous Organics ▩ Aqueous TC Metals ▤ Inorganic Sludge
 ▦ Lead Shielding □ Soil/Dirt ▧ Other

* Does not include mass due to containers.

"Other" contains Batteries, Bulk (nontoxic) Metals, Bulk Cadmium, Bulk Mercury, and Miscellaneous Glass.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.102. Radiological Distribution for
Savannah River Site
Derived for the ITTS Study**

Information obtained from the DOE/RW-0006-Rev.8, October 1992 and EPA 520/1-91-010-2, May 1991.

**Figure 3.103. Physical Matrix Distribution for
Weldon Spring Site
Derived for the ITTS Study***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.104. Combustible vs. Noncombustible
for Weldon Springs Site
Derived for the ITTS Study
(TOTAL=53,936 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.105. Combustible Physical Matrix
Distribution for Weldon Spring Site
Derived for the ITTS Study
(Combustibles=32,590 Kg)***

* Does not include mass due to containers.
Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993.

**Figure 3.106. Noncombustible Physical Matrix
Distribution for Weldon Spring Site
Derived for the ITTS Study
(Noncombustibles=21,345 Kg)***

* Does not include mass due to containers.

Information obtained from the DOE/NBM-1100 (MWIR Report), April 1993

**Figure 3.107. Radiological Distribution for
Weldon Spring Site
Derived for the ITTS Study**